Research Note 84-38

ESTIMATING MANPOWER, PERSONNEL, AND TRAINING REQUIREMENTS

EARLY IN THE WEAPON SYSTEM ACQUISITION PROCESS:

AN APPLICATION OF THE HARDMAN METHODOLOGY

TO THE ARMY'S DIVISION SUPPORT WEAPON SYSTEM (APPENDICES)

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U. S. Army



Research Institute for the Behavioral and Social Sciences

February 1984

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A Navy methodology designed to assess the human resource requirements of emerging weapon systems was applied to the Army's proposed Division Support Weapon System (DSWS), a self-propelled howitzer system which will eventually replace the present M109 howitzer series. The goal of the project was to determine whether or not this HARDMAN (hardware vs. manpower) Methodology could be used to examine the manpower, training, and personnel demands of proposed Army weapon systems. While the project examined only one system, the

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results of the project indicated that Army data was reasonably good in this case and the general analytic approach appeared to be useable. A second, more extensive project has been initiated to further assess the utility and generalizability of the methodology.				
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PREFACE

This report describes the application of the first four steps of the prototype HARDMAN methodology to an Army weapon system. The methodology was used to conduct an analysis of the manpower, personnel, and training requirements and costs generated by the operation and maintenance of the Self-Propelled Howitzer (SPH) of the proposed Enhanced Self-Propelled Artillery Weapon System (ESPAWS).

The prototype HARDMAN methodology is an integrated set of data base management techniques and analytic tools, designed to provide timely and fully documented assessments of the human resource requirements and costs associated with an emerging system's design. Additionally, the methodology provides the capability to determine the impact of a system's manpower, personnel, and training resource demand on the Army's current and/or projected supply of those assets, thereby targeting problem areas in system supportability. Effective tradeoff analyses can then be conducted through iteration of the methodology.

Volume I of this report details the application of the first four steps of the HARDMAN methodology to the ESPAWS SPH and the study's findings. Volume II provides supporting or supplemental data in a number of appendices.

The study effort was authorized under Task Order A-1 of Contract Number N61339-80-D-0005. The contract monitors were Drs. Donald O. Weitzman and Daniel T. Risser. Work related to the study was conducted by members of the Advanced Systems Department, Dynamics Research Corporation, Wilmington, Massachusetts. The Contract Program Manager was Peter Weddle. The Report Manager was Thomas E. Mannle, Jr. Principal contributors on the DRC Staff were Laurel Brown, David Herlihy, Edward Marquardt, Lawrence O'Brien, and Cecil Wakelin. Other contributors were Marjorie Bristol, John Glasier, David Hickernell, Richard Mills, John Snow and Annemarie Walsh. The principal programming was accomplished by Alan Pincus and Robert Kistler; David Hickernell provided supplementary programming. Administrative support was provided by Mary Shaffer, Nancy Tannalfo, Dianna DiGregorio, Debra Allfrey, Anne Bauman, Debra Mahoney, and Beth Kosis.

The success of the project was due in large part to the cooperation of a number of government organizations which provided support and assistance to ARI but bear no

responsibility for the results of the study. ARI is particularly grateful for the assistance provided by the U.S. Army Armaments Research and Development Command, Dover, New Jersey, (Program Manager - Cannon Artillery Weapon Systems); the U.S. Navy HARDMAN Program Office, Naval Annex, Washington, D.C.; the U.S. Army Field Artillery Center and School, Fort Sill, Oklahoma (TRADOC System Manager -- Cannon); Headquarters, Fort Sill, Oklahoma (Comptroller); the ARI Field Unit, Fort Sill, Oklahoma; Headquarters, Training and Doctrine Command (TRADOC) Fort Monroe, Virginia (Deputy Chief of Staff -- Resource Management, and Deputy Chief of Staff -- Training); and the U.S. Army Armaments Material Readiness Command, Rock Island, Illinois (Logistics Assessment).

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INTRODUCTION

The information presented in Appendices A through C was developed during the application of the HARDMAN Methodology to the Enhanced Self-Propelled Artillery Weapon System (ESPAWS) prior to and during the conceptual stage of its development. A Consolidated Data Base (CDB) was developed to support the analysis of a suitable conceptual system to represent an ESPAWS design.

Appendix A contains descriptions of the data and data sources supporting the study. Appendix B describes the analytic tools which were used in each step of the methodology. Appendix C contains training analysis information which was included as a separate entity due to the volume of data and analysis products.

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Workload

runu	TIONAL AREA:	WISSION		
CATI	EGORY	DATA	SOURCE	COMMENTS
1.	Need	System Operational Need	Chief of Staff of the Army (CSA); Mission Element Need Statement (MENS)	MENS for ESPAWS issued Dec, 1980
2.	Capabilities	Operational Capability within Specified Areas	TRADOC: Fire Support Mission Area Analysis (MAA) Phase 1;	
		Mission Requirements	TRADOC: Battlefic Development Plan (BDP) GSA: MENS	eld
3.	Environment	Scenario	TRADOC: Field Artillery Center and School, Ft Sil	11,0К
		Operating Concepts (Logistics, Maintenance)	TRADOC: Field Artillery Center and School, Ft Sil	ll,OK
		Detailed Usage Data; i.e., scenario in terms of usage metrics	TRADOC: Field Artillery Center and School, Ft Sil Mission Profile/ Operational Mode Summary (MP/OMS)	Representative for
FUNC	CTIONAL AREA:	MANPOWER		
CATE	EGORY	DATA	SOURCE	COMMENTS

Navy: Main- Autoloader, tenance Data computer, AHRS Collection System. (MDCS)

Maintenance

FUNCTIONAL AREA: MANPOWER (CONTINUED)

TORCTIONAL AREA.		THAT COURT (CONTINUED)				
CATEGORY		DATA	SOURCE	COMMENTS		
		Maintenance	Army: AR:750-37 Sample Data Collection			
		Operational Manning	ARI: Howitzer Crew Size Model	Primary Fire Tasks		
		Operational Manning	Field Artillery School: Mission Profile for SPH			
2.	Methodology	Constraints	AR570-2 Manpower Authorization Criteria (MACRIT)			
		Allowances	AR570-2 Manpower Authorization Criteria (MACRIT)			
		Capabilities	Field Artillery School: Mission Profile for SPH			
		Projected Mission Environment	Field Artillery School: Mission Profile for SPH			
FUN	CTIONAL AREA:	TRAINING				
CAT	EGORY	DATA	SOURCE	COMMENTS		
1.	Task Requirements	Task by MOSC	Soldier's Manuals Commander's Manuals			
		Tasks by System	Field Manuals Technical Manuals			
		Tasks Accom- plished by MOSC	Consolidated Occupational Data Analysis Program (CODAP)			

FUNCTIONAL AREA: TRAINING (CONTINUED) SOURCE CATEGORY DATA COMMENTS Maintenance Field Manuals Tasks Technical Manuals Information Soldier's Manuals Skill/Skill 2. Task Require-Commander's Manuals Levels ments Required by Skill Level AR611-201 Enlisted MOS Skill Career Management Fields Descriptions and Occupational Specialties Oualification Skill Qualification Standards Tests (SQT) 3. Course Training Comptroller of the Information Paths Army (COA): Military Occupational Specialty Cost Handbook Synopsis of U.S. Army Formal Formal School Schools Catalog, DA PAM 351-4 Courses Synopsis of Army Correspon-Correspondence Course dence Courses Program Synopsis of Individual and Planned Army and Collective Training Outline Training Courses Plan (ICTP) TRADOC Form 377-R Instructor Determination for relevant Data courses List and Training Index And Description Description Devices/ of Army Training Devices Extension of Current (DA PAM 310-12) Catalog of Training Items in TASO Training Devices (TRADOC Materials Inventory PAM 71-9) Extension Material Status List (Quarterly

Publication)

FUNCTIONAL AREA: PERSONNEL

DATA SOURCE COMMENTS **CATEGORY** Army Personnel MILPERCEN 1. Current Enlisted Enlisted Master Status File (EMF) Personnel Information AR611-201: Enlisted 2. Personnel Military Management Occupational Career Management Fields and Military Specialty Information Occupational Specialties **FUNCTIONAL AREA:** COST SOURCE COMMENTS **CATEGORY** DATA ARRADCOM LCC 1. Hardware Development Guidance ESPAWS Costs Contractors ARRADCOM LCC Operating and Support Costs Guidance ESPAWS Contractors Comptroller of the 2. Personnel Salaries Army (COA): Force Cost Information System: Army Force Planning Cost Handbook (AFPCH) Other Per Capita Costs Comptroller of the Army (COA): Force Cost Information System: Army Force Planning Cost Handbook (AFPCH) Per Capita Factor COA: Soldier Cost Information 3. Training Course Cost System: MOS Training Elements:

Cost Handbook (MOSB)

Aggregate

FUNCTION AREA: COST (CONTINUED)

CATEGORY

DATA

SOURCE

COMMENTS

Detailed

1RADOC: Cost Analysis of Training Centers and Schools

(one each)

Cost Factors and TRADOC: Resource

Factors Handbook

Estimating

Relationships

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APPENDIX A2 THE SAMPLE DATA COLLECTION SYSTEM

A2.1 BACKGROUND

The Army has no periodic field maintenance data reporting system. Interviews with Army sources revealed that this was not always true. From 1962 until 1969, there was such a reporting system in effect, known as TAERS — The Army Equipment Reporting System. Data collected under the TAERS system were not viewed as being either accurate or reliable for a number of reasons. Prominent among these were that:

- Data were collected by unit personnel in addition to their normal duties;
- Little feedback was received by unit personnel on the purposes for which the data were used.
 Consequently there was little incentive to record data accurately; and,
- Recognition of these circumstances at the National Maintenance Points (to which data flowed), caused data to be viewed as suspect and thus not exploited, further compounding the problem at the unit level.

In 1969, the TAERS system was eliminated, due to the circular nature of the problem and as a result of resource pressures caused by the Vietnam conflict. In the early 1970's, the Army initiated the Sample Data Collection (SDC)

system in an effort to receive accurate field maintenance data without reporting the TAERS experience.

A2.2 THE SAMPLE DATA COLLECTION SYSTEM

The Sample Data Collection System is prescribed by Army Regulation (AR) 750-37, the most recent version of which is dated June 15, 1977. AR 750-37 prescribes three types of data collection:

- Free Flow: Unedited data recorded by unit personnel, on existing maintenance (TAMMS) forms, and submitted to the National Maintenance Point level.
- Semi-Controlled: Data are recorded by unit personnel on standard or reasonably modified TAMMS forms. On-site representatives collect, edit, and format the data.
- Controlled/Intense: Data are recorded by dedicated data collectors, possibly on special forms.

AR 750-37 also provides that before an SDC effort is approved, an SDC plan must be developed. An SDC plan contains a description of the equipment on which data collection is desired (description, range); the nature, purpose, use, and users of the data; duration, cost of the effort, and the expected availability of resources; sampling technique, sample size, statistical, and engineering analysis methods; and, the essential elements information, data portrayal, and output product

requirements. A draft Department of the Army (DA) Circular is also included, since each SDC effort is promulgated by circular.

Before SDC plans are approved, AR 750-37 requires each plan to be coordinated so as to ensure proper interface with all existing developmental management information systems that use or plan to use SDC data as inputs. Data requirements of users, other than those who originated the requirement for the data, can then be integrated into the SDC plan.

As of March, 1981, there have been 77 SDC efforts. Some of these have been multiple or extended efforts on the same item or items of equipment. Table A2-1 displays the list of SDC efforts.

A2.3 THE FIELD ARTILLERY SAMPLE DATA COLLECTION (FA SDC)

The Field Artillery Sample Data Collection was initiated in 1977. For the M109Al subset of the FA SDC, data collection efforts were begun in January, 1977, at Fort Sill, Oklahoma, and in May, 1977, at Fort Hood, Texas and Grafenwoeher, Germany. One battalion (18 SPH) at Fort Sill, two battalions (42 SPH) at Fort Hood, and battalions selected during their annual training cycle in Germany were part of the sample. Over the 2.5 year period (for the tape which DRC used) the sample size was 72 SPH.

Data were collected by contractor personnel using Form 260 from the Armaments Readiness Command (ARRCOM) at Rock Island, Illinois. ARRCOM is the proponent and custodian of the FA Sample Data Collection. These data were formatted by ARRCOM onto computer tape into 44 fields of information.

Table A2-1 SAMPLE DATA COLLECTION EFFORTS

Circular No.	Equipment Nomenclature	Type Collection
		
750-37-1	Gun, Air Defense 20mm M114A1E1	Note: Semi-Controlled
750-37-2	Generator, 60kw 60Hz SF-60-MD	Unless otherwise noted
750-37-3	Truck, ¼ ton, M151A1/A2	
750-37-4	Armored Reconnaissance Airborne Assault Vehicle, M551	
750-37-5	Truck 5 Ton M809	
750-37-6	Truck 1-¼ ton, M561	
750-37-7	Terminal, Digital Subscriber AN/FYA-71	
750-37-8	Radio Set, AN/GRC-106A	
750-37-9	Radar Set, AN/PPS-5A	
750-37-10	Radio Set, AN/GRC-143	
750-37-11	Truck, Commercial Tractor 5 ton 1HC Model 2000D	
750-37-12	LANCE	
750-37-13	Generator, 15kw 60Hz SF-15-MD	
750-37-14	Gun, Air Defense, M163A1 VULCAN	
750-37-15	M 551 (Extend)	
750-37-16	M 151 (Extend)	
750-37-17	AN/FYA-71 (Extend)	
750-37-18	M561 (Extend)	
750-37-19	VULCAN (Extend)	
750-37-20	Trucks, 5 ton and 2-1/2 ton, Useful Life	
750-37-21	LANCE (Extend)	
750-37-22	HAWK	
750-37-23	Truck, Commercial Tractor, 2000D (Extend)	
750-37-24	Teletype, TT-636U	
750-37-25	M561 (Extend—3rd year)	
750-37-26	M151 (Extend—3rd year)	
750-37-27	HAWK (Extend)	
750-37-28	LANCE (Extend—3rd year)	
750-37-29	Trucks, 5 and 2-1/2 ton, Useful Life (Extend)	
750-37-30	GOER Vehicle	
750-37-31	Countermeasures Set, AN/GLQ-3	
750-37-32	GOER Vehicle	
750-37-33	Trucks, 5 and 2-1/2 ton, Useful Life (Extend)	
750-37-34	Generator, 60kw (2nd time)	
750-37-36	Truck, M880	
750-37-36	Truck, 5 ton (Extend)	
750-37-37	Field Artillery Weapons Systems	
750-37-38	Tugs	
750-37-39	COMSEC Equipment, TSEC/KG-27	
750-37-40	Truck, 5 ton (Extend)	
750-37-41	Helicopter, Attack, AH-15 COBRA	
750-37-42	M880 (Extend)	
750-37-43	Field Artillery Weapon Systems (Extend-2nd year)	
750-37-44	M880 (Extend)	

Table A2-1 (continued)

DA		
Circular No.	Equipment Nomenclature	Type Collection
750-37-45	Administrative Use Vehicles (AUV) in Germany	
750-37-46	Transport, Heavy Equipment, M911	
750-37-47	FA Weepon Systems (Extend, 3rd year)	Controlled
750-37-48	Rader, Forward Area Acquisition (FAAR)/Chapperral	
750-37-49	Aircraft Systems	
750-37-50	Fire Control, AN/TSQ-73	
750-37-51	VULCAN .	Controlled
750-37-52	COMSEC equipment, TSEC/KY-57/58 VINSON	Controlled
750-37-53	M880 (Extend)	
750-37-54	Tank, M60A3	Controlled
750-37-55	Trucks, Medium and Heavy, M915 series	
750-37-56	Helicopter, Utility, UH-60 Blackhawk	Controlled
750-37-57	Helicopter, Utility, UH-60 Blackhawk	Semi-Controlled
750-37-58	M911 (Extend)	
750-37-59	AUV	
750-37-60	AN/TSQ-73 (Extend)	
750-37-61	FAAR/Chaparral (Extend)	
750-37-62	Aircraft Systems	
750-80-1	FA Weapon Systems (Extend-4th year)	Controlled
750-80-2	Radio Receiver Set, AN/URR-74	
750-80-3	Generators, 5kw, 15kw, 30kw	
750-80-4	VINSON (Extend)	
750-80-5	M880 (Extend)	
750-80-6	Improved HAWK	
750-80-7	M60A3 (Extend)	
750-80-8	M915 (Extend)	
750-80-9	UH-60 (Extend)	Controlled
750-80-10	M911 (Extend)	
750-80-11	Tank and Pump Unit, Petroleum	
750-81-1	Landing Craft, Utility	
750-81-2	Ribbon Bridge	
750-81-3	Medical Unit Surgical, Transportable (MUST)	
750-81-4	UH-60 (Extend)	Semi-Controlled

Source: US Army Meteriel Development and Readiness Command (DARCOM)

DRC extracted 23 fields of interest for the ESPAWS study effort. Table A2-2 portrays one maintenance incident as it appears on the extracted tape, and Table A2-3 provides a fuller explanation of the extracted fields.

A2.4 DRC DATA MANIPULATION TECHNIQUES

From discussions with ARRCOM personnel, and by inspecting an abstract of the data contained in the M109Al SDC, DRC recognized that the SDC afforded the opportunity to compute at least the RAM parameters of interest, if not also maintenance workload. However, before these analysis processes could begin, the raw data had to be processed into a form suitable for analysis. The techniques developed by DRC to process the data will be described here. Appendices Bl through B3 describe the analysis routines and programs developed by DRC to convert the processed data into meaningful inputs for the HARDMAN methodology.

Figure A2-1 portrays the flow of data through the required manipulation routines. The data were first converted to the format required by DRC's Honeywell mainframe computer. An routine (/CONVER.C) provided a tape maintenance incident described by the 23 information fields of interest to the ESPAWS study, rather than the 44 fields on the original tape. A sort routine separated the useable records from those that could not be used. Of the original records on tape, only 3209 were found to contain manhours information, which was needed to compute maintenance workload. The other records on the original tape indicated one of three circumstances: (1) a vehicle entering the SDC sample, indicated by "BASE", instead of the normal incident number; (2) a vehicle leaving the SDC sample indicated by a

Table A2-2 FA SAMPLE DATA COLLECTION (EXTRACT)

T2488 2108 M109A1 932 2219 932 23199 184.00 0710 B TRANSMISSION 2520-735-4210 835 1099 BA 3.0 3.0 8.0 0.0 6.0 3.0 16.0 0.0 63C 5 3 13B 5 3 13B 4 3 63H 5 8 63H 4 8 DS 8055 M Q N

INCIDENT NO.	:	T2488	EFFECT	:	В
VEHICLE SERIAL NO.	:	2108	ACTION	:	A
SYSTEM	:	M109A1	AMT	:	3.0 3.0 8.0 0.0
ROUNDS ON SYSTEM (CUM)	:	932	MMH	:	6.0 3.0 16.0 0.0
MILES ON SYSTEM (CUM)	:	2219	SPEC, GR, MH	:	63C 5 3
ROUNDS ON TUBE (CUM)	:	932			13B 5 3
TUBE SERIAL NO.	:	23199			138 4 3
PART COST	:	184.00			63H 5 8
GG NO.	:	0710			63H 4 8
SUBSYSTEM	:	В	PART FROM	:	DS
PART NAME	:	TRANSMISSION	JULIAN DATE	:	8055
NSN	:	2520-735-4210	DEPENDENCY	:	M
PART NUMBER	:	8351099	FAILURE CODE	:	Q
			H/N	:	N

Table A2-3 DESCRIPTION OF SDC FIELDS

Field

Description

Incident No.

First character is letter (or blank) indicating where the incident took place. Next four characters form a chronological incident number unique to that site. Sixth character has two possibilities: "S," if an incident is pursuant to another incident, and "T" if the particular system is leaving the SDC sample. "BASE" instead of the standard incident

number format indicates an entry into the SDC sample.

Vehicle Serial No.

Self-explanatory. A letter in the last position indicates vahicles that

have transferred out of SDC and then reappear later.

System

M109A1, all cases

Rounds on System (CUM)

Cumulative rounds fired by the system since last rebuild

Miles on System (CUM)

Cumulative miles driven by the system since last rebuild

Rounds on Tube (CUM)

Cumulative rounds on tube since manufacture

Tube Serial No.

Self-explanatory

Part Cost

Standard price of part(s) replaced or used

GG No.

Government Functional Grouping Code of the subsystem which was the

root cause of the incident

Subsystem

Same purpose as GG No. except alphabetic and less extensive functional

breakdown.

Part Name

Part name (of general type of maintenance) which was repaired or

replaced (or performed) on the vehicle.

NSN

National Stock Number of the replaced pents

Part No.

Manufacturer's part number, listed in Technical Manuals

Effect

Represents the effect of the malfunction on the vehicle's ability to

perform.

A: Critical/safety

B: Mission Stop/Start

C: Other

Action

Type of maintenance action required to correct the malfunction

A: Replace/unscheduled
B: Repair/unscheduled

C: Preventive/scheduled

D: Adjust E: Other

AMT

Active Maintenance Time: Clock or elapsed maintenance time between the start of a maintenance action and its completion. Four values,

one each for the crew, organizational, direct support, and general

support echelons of maintenance, respectively.

MMH

Maintenance Manhours. Same format as AMT.

Table A2-3 (continued)

Field

Description

SPEC, GR, MMH

A five variable array, each variable containing the specialty (MOS) and paygrade of an individual performing maintenance and the maintenance manhours he or she devoted to the task. Not arranged

by echelon.

Part From

Echelon of supply that supplied the part

Julian Date

Date of the incident

Dependency

Usage criteria to record malfunction against a particular subsystem.

M: Miles driven

R: Rounds fired

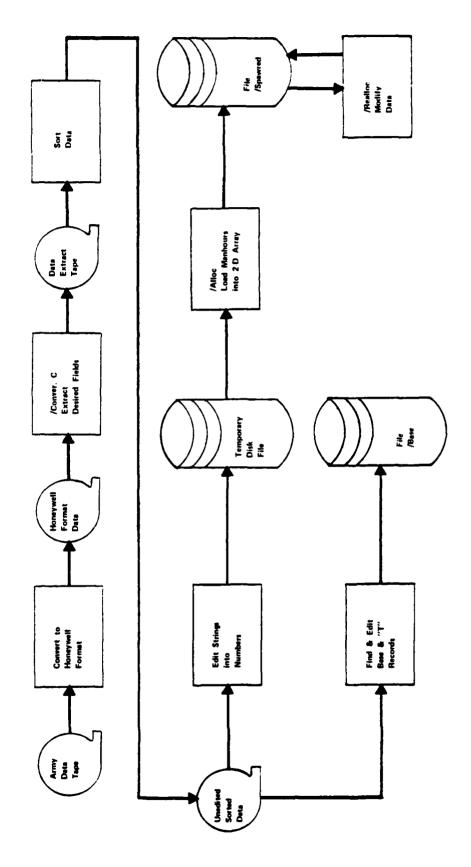
Failure Code

Failure code (FCD) of the incident as judged by ARRCOM. The FCD alphabetic matrix combines two scoring criteria, the ARRCOM/TRADOC

(SC), and the Joint Munitions Effectiveness Manual (JMEM).

H/N

Failure chargeable to either hardware or non-hardware causes.



"T" suffix (for transferred) to the incident number; and (3) an incident pursuant to another incident, indicated by an "S" suffix (for supplementary record) to the normal incident numbers. (While the "BASE and T" records could not be used in calculating maintenance manhours, they were used to establish start and end points for each vehicle in the SDC, and to compute the Mean Metric (Miles, Rounds) Between Failure. This computation routine used the /BASE and /SPAWRED Files; however, the computational step itself is not shown on the flowchart.) An additional 100 records were excluded because indicated they they encompased miscellaneous "NO TEST" conditions. Table A2-4 summarizes the derivation of records useable for computation of maintenance manhours from the original SDC data.

Another and more significant development in the data manipulation flow was the need to develop the REALLOC REALLOC allowed modification of the data (i.e., changing, adding, or deleting data element values). was necessary because the SPEC, GR, and MMH field (see Table A2-2) was not arrayed by echelon. Although AMT and MMH were identified to a particular echelon, the design of ARRCOM Form 260, on which the data were collected, permitted only five entries for the SPEC, GR, and MMH field. Thus, data entry was haphazard, in some cases in descending or ascending numerical MOS order, in other cases by MMH quantity order. Standard sort and edit routines could match the MMH part of the SPEC, GR, and MMH field to the AMT and MMH fields for a provisional allocation of MOSs to echelons; in some cases. however, the results were MOS unsatisfactory, e.g., an 13B (Cannon Crewmember) appearing at the general support echelon of maintenance, and a civilian wage grade worker appearing at the crew level.

Table A2-4 DERIVATION OF USABLE RECORDS

Description		Number	
Total	Records	6031	
Less:	Records with No Maintenance Manhours	2722	
	"BASE": start SDC	(599)	
	• "T" Suffix: Complete SDC	(581)	
	"S" Suffix: Supplementary Record	(1542)	
	Miscellaneous "No Test" Records	100	
Total,	Usable Records	3209	
	Unscheduled Maintenance	(3623)	
	Scheduled Maintenance	(586)	

DRC developed /REALLOC as an interactive update program which allowed review of each maintenance incident. In cases where the provisional allocation of an MOS to a particular echelon appeared questionable, /REALLOC was used to reallocate the existing labor to echelons consistent with the TOE, insofar as possible. While /REALLOC was also developed with the capability to change, add, or delete data from the existing record, this capability was not exercised except to correct what appeared as obvious data entry errors.

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APPENDIX A3

EQUIPMENT LISTS

- A3.1 Predecessor System Equipment List
- A3.2 Reference System Equipment List
- A3.3 Conceptual System Equipment List

A3.1 PREDECESSOR SYSTEM EQUIPMENT LIST

Group Number	Component/Assembly
0100	Engine, V8 diesel, model 8V71T, Detroit Diesel GMC; and Shock mounts
0101	Cylinder head
0102	Vibration damper
0103	Flywheel
0104	Pistons and connecting rods
0105	Valves and valve rockers
0106	Oil filter, oil cooker, and external lines/fittings
0108	Exhaust manifold
0109	Accessory drive mechanism
0301	Fuel injector
0302	Fuel pump and relief valve
0304	Air cleaner, filter pack, ducts, hoses,
	and dust exhaust motor
0305	Engine intake blower, blower drive shaft, turbo charger, air duct, and tubocharger
	regulator
0306	Fuel tank, fuel lines, and fittings
0308	Engine governor
0309	Primary and secondary fuel filter element and fuel filters
0311	Engine heater air box
0312	Injector rock control, control tube, accelerator and throttle control linkage, and rod end bearings
0401	Exhaust pipe
0501	Radiator
0502	Radiator shroud
0503	Water manifold, thermostat; hoses and pipes
0504	Water pump
0505	Fan drive assembly and fan drive housing; fan thermostat
0507	Unspecified cooling system parts
0601	Leece-Neville alternator, model A001-5504AA
0602	Voltage regulator and rectifier
0603	Starter and starter solenoid; field coil; starter drive
0607	Circuit breaker; instrument panel and wiring harness lamps; indicator light; accessory socket and switches

0608	Circuit breaker relay and switches; starter and master relays; motor relay		
0609	Lamp and lamp units; lights and dome		
	light		
0610	Sending units and warning switches		
0612	Batteries (12V-type 6TN) and battery cables		
0613	Wiring harnesses (hull, cab and power plant)		
0614	Electrical contact brushes and slip rings		
0616	Ventillating blower		
0617	Trailer electrical coupling		
0618	Rammer control assembly; cab power relay		
3010	box; gunner's selector switch box; rammer switches and wiring harness; intercom wiring harness		
0710	Transmission (model XTG-411-2A, Allison Div., GMC) and transmission seals,		
0711	coupling shaft, brake and control valve		
0/11	Shifting controls and linkage/rod end		
0714	brearing		
0714	Control valve		
0719	Trainer		
0721	Transmission oil pump and filter		
0801	Power transfer and final drive assemblies		
1103	Final drive		
1201	Hand brakes		
1206	Mechanical brakes		
1301	Torsion bar		
1302	Road wheel and arm; hub brearing; hub bearing seal		
1303	Eccentric spindle control; spindle seal;		
	track adjusting cylinder; idler arm and		
	wheel; track idler support housing		
1304	Drive sprocket and hubs		
1305	Track and track shoes		
1401	Steering controls		
1503	Towing hooks; pintel		
1604	Shock absorbers and road wheel arm bumper		
1801	Cover plate and doors; travel lock		
1802	Fender and track skirt		
1803	Driver's hatch		
1806	Seat		
1808	Boxes, sockets and straps		
1901	Tureet race		
1903	Doors and ports		
1904	Traversing mechanism and controls		
1906	Internal and external stowage		
1909	Rammer and spade hoist assembly		

1910	Equilibrating elevating mechanism and
	controls
2005	Spade and spade lock
2205	Bilge pump
2207	Personnel heater; heater fuel filter,
	igniter and flame detector switch
2210	Vehicle data plate
2604	Cannon bore brush assembly
2801	Sighting and fire control equipment:
	Commander's periscope (M42)
	Panoramic telescope (M117)
	Panoramic telescope mount (M145)
	Direct fire telescope (M118C and
	M11CA1)
	Direct fire telescope mount (M146)
	Elevation quadrant (M15)
	Trunion bracket ring
	Infinity aiming reference collimator
	(M1)
	Carrying case (M82)
3303	Winterization
3307	Deep water fording
3401	Cannon (M126A1/M185) 155mm and mount
	(M127)
3402	Machine gun .50 calibre (M2)
3403	RFire control
4309	Hydraulic equilibration system; primary
	and secondary accumulators
4701	Speedometer and speedometer drive
	components; tachometer and tachometer
	drive components
7639	Fixed (10 lb. bottle) system and portable
	(5 lb.) bottles
9501	Hardware supplied in bulk materials
	• •

A3.2 REFERENCE SYSTEM EQUIPMENT LIST

Group Number	Component/Assembly				
0100	Engine, V8 diesel, model 8V7lT, Detroit Diesel GMC; and Shock mounts				
0101	Cylinder head				
0102	Vibration damper				
0103	Flywheel				
0104	Pistons and connecting rods				
0105	Valves and valve rockers				
0106	Oil filter, oil cooker, and external				
0100	lines/fittings				
0108	Exhaust manifold				
0108					
	Accessory drive mechanism				
0301	Fuel injector				
0302	Fuel pump and relief valve				
0304	Air cleaner, filter pack, ducts, hoses,				
0305	and dust exhaust motor				
0305	Engine intake blower, blower drive shaft,				
	turbo charger, air duct, and tubocharger				
	regulator				
0306	Fuel tank, fuel lines, and fittings				
0308	Engine governor				
0309	Primary and secondary fuel filter element				
	and fuel filters				
0311	Engine heater air box				
0312	Injector rock control, control tube,				
	accelerator and throttle control linkage,				
	and rod end bearings				
0401	Exhaust pipe				
0501	Radiator				
0502	Radiator shroud				
0503	Water manifold, thermostat; hoses and				
	pipes				
0504	Water pump				
0505	Fan drive assembly and fan drive housing;				
	fan thermostat				
0507	Unspecified cooling system parts				
0601	Leece-Neville alternator, model A001-				
	5504AA				
0602	Voltage regulator and rectifier				
0603	Starter and starter solenoid; field coil;				
	starter drive				
0607	Circuit breaker; instrument panel and				
	wiring harness lamps; indicator light;				
	accessory socket and switches				
0608	Circuit breaker relay and switches;				
	starter and master relays; motor relay				
	_ · · · · · · · · · · · · · · · · · · ·				

and the second second

0609	Lamp and lamp units; lights and dome light
0610	Sending units and warning switches
0612	Batteries (12V-type 6TN) and battery
	cables
0613	Wiring harnesses (hull, cab and power
0013	plant)
0614	Electrical contact brushes and slip rings
0616	Ventillating blower
0617	Trailer electrical coupling
0618	Rammer control assembly; cab power relay
0010	box; gunner's selector switch box; rammer
	switches and wiring harness; intercom
	· · · · · · · · · · · · · · · · · · ·
0710	wiring harness
0/10	Transmission (model XTG-411-2A, Allison
	Div., GMC) and transmission seals,
0711	coupling shaft, brake and control valve
0711	Shifting controls and linkage/rod end
0714	brearing
0714	Control valve
0719	Trainer
0721	Transmission oil pump and filter
0801	Power transfer and final drive assemblies
1103	Final drive
1201	Hand brakes
1206	Mechanical brakes
1301	Torsion bar
1302	Road wheel and arm; hub brearing; hub
• • • •	bearing seal
1303	Eccentric spindle control; spindle seal;
	track adjusting cylinder; idler arm and
	wheel; track idler support housing
1304	Drive sprocket and hubs
1305	Track and track shoes
1401	Steering controls
1503	Towing hooks; pintel
1604	Shock absorbers and road wheel arm bumper
1801	Cover plate and doors; travel lock
1802	Fender and track skirt
1803	Driver's hatch
1806	Seat
1808	Boxes, sockets and straps
1901	Tureet race
1903	Doors and ports
1904	Traversing mechanism and controls
1906	Internal and external stowage
1909	Rammer and spade hoist assembly
1910	Equilibrating elevating mechanism and
	controls

1920	Attitude Heading and Reference System: AN/ASN-107
1925	FM Radio: AN/VRC-12
1930	Ammunition Autoloader: FMC design
1550	configured from MK 42 Mod 10 5"/54 gun
	mount
2005	Spade and spade lock
2205	Bilge pump
2207	Personnel heater; heater fuel filter,
	igniter and flame detector switch
2210	Vehicle data plate
	Cannon bore brush assembly
2801	Sighting and fire control equipment:
	Commander's periscope (M42)
	Panoramic telescope (M117)
	Panoramic telescope mount (M145)
	Direct fire telescope (Ml18C and
	MllCAl)
	Direct fire telescope mount (M146)
	Elevation quadrant (MI5)
	Trunion bracket ring
	Infinity aiming reference collimator
	(M1)
	Carrying case (M82)
2810	Fire Control Computer: AN/ASQ-155
3303	Winterization
3307	Deep water fording
3401	Cannon (M126A1/M185) 155mm and mount
	(M127)
3402	Machine gun .50 calibre (M2)
3403	RFire control
4309	Hydraulic equilibration system; primary
	and secondary accumulators
4701	Speedometer and speedometer drive
	components; tachometer and tachometer
	drive components
7639	Fixed (10 lb. bottle) system and portable
	(5 lb.) bottles
9501	Hardware supplied in bulk materials

A3.3 CONCEPTUAL SYSTEM EQUIPMENT LIST

Group Number	Component/Assembly
*0100	Engine, V8 diesel, model 8V7lT, Detroit Diesel GMC; and Shock mounts
*0101	Cylinder head
*0102	Vibration damper
*0103	Flywheel
*0104	Pistons and connecting rods
*0105	Valves and valve rockers
*0106	Oil filter, oil cooker, and external lines/fittings
*0108	Exhaust manifold
*0109	Accessory drive mechanism
*0301	Fuel injector
*0302	Fuel pump and relief valve
*0304	Air cleaner, filter pack, ducts, hoses, and dust exhaust motor
*0305	Engine intake blower, blower drive shaft, turbo charger, air duct, and tubocharger regulator
*0306	Fuel tank, fuel lines, and fittings
*0308	Engine governor
*0309	Primary and secondary fuel filter element and fuel filters
*0311	Engine heater air box
*0312	Injector rock control, control tube, accelerator and throttle control linkage, and rod end bearings
0401	Exhaust pipe
*0501	Radiator
*0502	Radiator shroud
*0503	Water manifold, thermostat; hoses and pipes
*0504	Water pump
*0505	Fan drive assembly and fan drive housing; fan thermostat
*0507	Unspecified cooling system parts
*0601	Leece-Neville alternator, model A001-5504AA
* 0607	Voltage regulator and rectifier
*0603	Starter and starter solenoid; field coil; starter drive
*0607	Circuit breaker; instrument panel and wiring harness lamps; indicator light; accessory socket and switches

* Improved RAM

*0608	Circuit breaker relay and switches; starter and master relays; motor relay
*0609	Lamp and lamp units; lights and dome
	light
*0610	Sending units and warning switches
*0612	Batteries (12V-type 6TN) and battery cables
*0613	Wiring harnesses (hull, cab and power
0013	plant)
*0614	Electrical contact brushes and slip rings
*0616	Ventillating blower
*0617	Trailer electrical coupling
*0618	Rammer control assembly; cab power relay
0010	box; gunner's selector switch box; rammer
	switches and wiring harness; intercom
	· · · · · · · · · · · · · · · · · · ·
0710	wiring harness Transmission (model XTG-411-2A, Allison
0/10	Div., GMC) and transmission seals,
	coupling shaft, brake and control valve
0711	Shifting controls and linkage/rod end
0/11	
0714	brearing Control valve
0719	
	Trainer
0721	Transmission oil pump and filter
0801 1103	Power transfer and final drive assemblies
	Final drive
1201	Hand brakes
1206	Mechanical brakes
*1301 *1302	Torsion bar
"1302	Road wheel and arm; hub brearing; hub
*1303	bearing seal
1202	Eccentric spindle control; spindle seal;
	track adjusting cylinder; idler arm and
*1304	wheel; track idler support housing
*1304	Drive sprocket and hubs Track and track shoes
1401	Steering controls
1503	Towing hooks; pintel
1604	Shock absorbers and road wheel arm bumper
1801	
1802	Cover plate and doors; travel lock Fender and track skirt
1803	Driver's hatch
1806	Seat
1808	Boxes, sockets and straps
1901	Tureet race
1901	Doors and ports
1903	Traversing mechanism and controls
1904	Internal and external stowage
2700	Intolinal and excelled Scowage

^{*} Improved RAM

1909	Rammer and spade hoist assembly		
1910	Equilibrating elevating mechanism and		
	controls		
1920	Land Navigation System: Singer-Kearfott		
	KHS-2100		
1925	FM Radio: AN VRC-12		
1930	Ammunition Autoloader: FMC design		
	configured from MK 42 Mod 10 5"/54 gun		
	mount (modified)		
2005	Spade and spade lock		
2205	Bilge pump		
2207	Personnel heater; heater fuel filter,		
	igniter and flame detector switch		
2210	Vehicle data plate		
2604	Cannon bore brush assembly		
2801	Sighting and fire control equipment:		
	Commander's periscope (M42)		
	Panoramic telescope (M117)		
	Panoramic telescope mount (M145)		
	Direct fire telescope (M118C and		
	MllCAl)		
	Direct fire telescope mount (M146)		
	Elevation quadrant (M15)		
	Trunion bracket ring		
	Infinity aiming reference collimator		
	(M1)		
	Carrying case (M82)		
2810	Fire Control Computer: AN/AYK-14		
3303	Winterization		
3307	Deep water fording		
3401	Cannon (M126A1/M185) 155mm and mount		
	(M127)		
3402	Machine gun .50 calibre (M2)		
3403	RFire control		
4309	Hydraulic equilibration system; primary		
	and secondary accumulators		
4701	Speedometer and speedometer drive		
	components; tachometer and tachometer		
	drive components		
7639	Fixed (10 lb. bottle) system and portable		
	(5 lb.) bottles		
9501	Hardware supplied in bulk materials		

APPENDIX A4 PERSONNEL DATA

This appendix describes the Army's Enlisted Master File (EMF) and the extract upon which the personnel analysis was based. The EMF contains current personnel data describing the status of all Army enlisted personnel. It is updated and maintained by the Army Military Personnel Center (MILPERCEN).

The extract from the EMF used for purposes of this study contains 43 data elements (the entire EMF contains approximately 225 elements) for each individual within 36 MOSs. Data were collected for these 36 MOSs prior to definitization of the group of eight MOSs which were to be analyzed for this study. Table A4-1 depicts the MOSs and data elements which comprise the EMF extract received from MILPERCEN.

Since MILPERCEN maintains historical snapshots of the EMF, it was possible to request four data extracts at once, for the current and previous three quarters. In addition, it was requested that there would be quarterly updates sent for the next year.

The data were, for the most part, complete and usable. The one exception is that the two fields of school history data were found to be incomplete. For example, for the Non-Commissioned Officer (NCO) Education System field, only 6% of all individuals had any code listed. A MILPERCEN EMF data base manager verified that the reason for this was that the information is not being reported to them by the

schools. Similary, Advanced Individual Training (AIT) graduation dates (1) do not contain the year of the graduation date, (2) are not properly reported, and (3) are incomplete in many cases. Because of these constraints, as mentioned in the text, career paths were dropped from the analysis at this point.

Table A4-1. Enlisted Master File Data Extract Received for ESPAWS Study.

MOS	Data Elements			
05B	Social Security Number (SSN)			
05C	Military Personnel Class			
13B	Active-Inactive Indicator			
13E	Sex of Service Member			
13F	Service Companent			
13Y	Term of Service or Enlistment			
132	Date of Expiration of Term of Service			
26L	Basic Active Service Date			
26Q	Date of Rank (Grade in which serving)			
31E	Grade in which Serving — Abbreviation			
31J	Grade in which Serving (Code)			
31V	Type of Last Grade Change			
31Z	Date of Last Grade Change			
32Z	Armed Forces Qualification Test Percentile Score (AFQSC)			
34G	Armed Forces Qualification Test Score Group (AFQG)			
35B	NCO Education System			
35E	Additional Skill Identifier			
41C	Location Abbreviation, Current/Geopolitical			
44B	Date of Last Permanent Change of Station			
45D	Date Departed or Joined Current Command			
45E	Location - Potential Gaining			
45K	Paygrade			
45L	Eligibility for Additional Pay			
45N	PMOS - How Acquired			
45R	Primary Military Occupational Specialty			
45Z	Type of Last Change to PMOS			
63B	Date of Last Change to PMOS			
63C	PMOS — Evaluation Score			
63D	Secondary Military Occupational Specialty			
63E	Projected MOS			
63F	Projected MOS Date (Year-Month)			
63G	Movement Designator Code			
63H	Year-Month Eligible to Return from Oversess			
63N	Number of Times Enlisted/Reenlisted			
63T	Year-Month Commenced Current Overseas Tour			
63Z	AIT Graduation Date			
	Progression Military Occupational Specialty - Primary			
	Primary MOS in which Tested, SQ Designator			
	PMOS Skill Qualification Test Score (SQT)			
	Previous SSN Date of Change			
	Social Security Number, Previous			
	Control Date, SSN Change			
	Unit Identification Code, O.M.			

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APPENDIX B

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APPENDIX B1 MAINTENANCE WORKLOAD DETERMINATION

Bl.1 The Reliability, Maintainablity, and Cost Model (RMCM)

The Reliability, Maintinability, and Cost Model (RMCM) was developed by DRC as part of the Life Cycle Cost Impact Model (LCCIM) Modeling System. DRC developed RMCM under contract to the Air Force Human Resources Laboratory at Wright-Patterson AFB, Ohio. The initial application of RMCM was in a study on the Digital Avionics Information Subsystem. It was also used in the Coordinated Human Resources Technology (CHRT) Study to evaluate the system ownership cost of the avionics and landing gear for the Advanced Medium Shortrange Transport (AMST) aircraft.

RMCM is actually a model within a model. It is composed of a Reliability and Maintainability (R&M) Model with its associated data bank, and a Cost Model which uses both inputs and outputs of the R&M Model and a cost data bank. The RMCM is an analytical accounting cost model which computes the life cycle cost of any proposed design for a system.

The R&M model portion of RMCM operates in conjunction with a computerized data bank containing historical reliability and maintenance data gathered from operational systems. This data is made relevant to new systems by factoring the historical data on the basis of system/subsystem comparability analyses. Inputs to the R&M Model include the of maintenance actions by subsystem, frequency task/event data for each maintenance action such as type,

probability of occurrence, average time to complete and manpower type and skill requirements.

The computed outputs of this model are expected values since they are based on average input values rather than peak demands or other constraints. These outputs are principally measures of the maintenance manhour resource requirements which may be expected to result under a given set of conditions. For this reason, DRC intended to use the R&M model portion of RMCM to calculate the maintenance workload requirements of the ESPAWS reference and conceptual designs.

However, upon examination of the data element inputs required for R&M, it was ascertained that R&M could not be used for the ESPAWS study effort. This was due to several factors:

- R&M is service specific in that it was developed for the Air Force.
- R&M is equipment specific in that it was developed for aircraft and aircraft-related applications.
- thus a model of a certain set of that of Air Force aircraft circumstances: maintenance. This reality is wholly different than the circumstances that exist for Army ground combat vehicles. For example, the Air Force has three echelons of maintenance while the Army has least four; the Air Force maintenance philosphy is generally one of remove and replace with off-equipment repair of replaceable

components, while the Army is more oriented to repair in place with repair parts, not components.

• The data input requirements for the R&M Model reflected the availability of maintenance data according to the management needs of the Air Force. These data were thus the quantitative expression of the Air Force maintenance philosophy.

These factors led to the conclusion that the R&M portion of RMCM, as it existed, was unsuitable for application to ESPAWS. In order for R&M to have been applied, it would have had to undergo extensive internal modifications for it to properly depict the maintenance circumstances and philosophy of the Army. It would also have required data elements to be created, assumed, or extrapolated to satisfy those input requirements of R&M for which the Army does not require data to be collected.

B 1.2 Determining Maintenance Workload

The Field Artillery Sample Data Collection (SDC) data provided an excellent alternative method for determining maintenance workload. As the development of RMCM was predicated on the existence of data of certain types and characteristics, the method developed relied upon the data elements contained in the SDC.

The principal advantage of SDC data over its counterparts in the Navy and the Air Force was that each SDC maintenance incident was characterized by the specialty (MOS), grade, and manhours of the personnel who provided the maintenance services. In the Navy applications of HARDMAN, the probability of maintenance events must be melded with task data through extensive task/event networks, which are then manipulated to derive workload. The SDC data afforded the opportunity to derive workload without extensive networking analyses. However, networking proved to be a valuable tool for depicting and ordering maintenance task/event relationships, even though the workload calculations proved to be much simpler.

The principal disadvantage of the SDC data was that the maintenance tasks were not described in greater detail, not only in contrast to the Air Force and Navy systems but even to generally accepted Army practice. For example, the SDC encompasses five task or maintenance action types, but the maintenance manual for the M109Al predecessor system describes ten types of discrete maintenance tasks. Thus maintenance workload could only be characterized to the task level contained in the SDC; more detailed task descriptions would have resulted in a more sophisticated analysis.

In summary, by relying on the SDC data it was easier to construct a new method for calculating maintenance workload than to have used the existing R&M portion of RMCM. Figure B1-1 summarizes the logic of the DRC-developed maintenance workload calculations.

Bl.3 DRC Modeling and Reporting Routines

Figure B1-2 depicts the DRC developed modeling and reporting routines which implements the logic for calculating

Figure B1-1 MAINTENANCE WORKLOAD CALCULATIONS

= PERIOD	WORKLOAD MAINTENANCE MANHOURS: BY ECHELON BY SUBSYSTEM BY MOS AND PAYGRADE	
MANHOURS MAINTENANCE ACTION	MAINTAINABILITY MAINTENANCE ECHELONS MAINTENANCE TASKS ACTIVE MAINTE- NANCE TIME MAINTENANCE MANHOURS	PERSONNEL PAYGRADE OF PERSONNEL SDC
MAINTENANCE ACTIONS USE	RELIABILITY FREQUENCY OF MAINTENANCE ACTIONS BY SUBSYSTEM	SDC
USE ×	INTENSITY PERIOD USAGE METRICS (MILES, ROUNDS, HOURS)	MISSION PROFILE/ OPERATIONAL MODE SUMMARY (MP/OMS)
	PARAMETER: Data elements:	DATA SOURCES:

maintenance workload. The refined SDC data are contained in two files, /SPAWRED and /BASE. (See Appendix A2.4) files are then manipulated (/GENMDL 1, 2, and 3) to create a model file for the predecessor M109Al system. /GENMDL 4 allows application of percentage perturbation factors to the predecessor equipment to create temporary reference and conceptual system files. These files are then updated by adding or subtracting equipments by using the /MODMDL resulting predecessor, reference, The program. conceptual system model files are input into the report generating routines (/MMHBYGG, /MMHBYMOS, and /AVLBYGG) to provide the desired outputs as shown. To generate a report, the user must input the file desired, the scenario in terms of the usage metrics of miles, rounds and hours, the maintenance type (scheduled or unscheduled) and whether a detailed or summary report is desired. Example outputs of the /MMHBYGG, /MMHBYMOS, and /AVLBYGG programs are shown in Tables B1-1, B1-2, and B1-3, respectively. A user's guide to the programs is contained in Appendix B2.

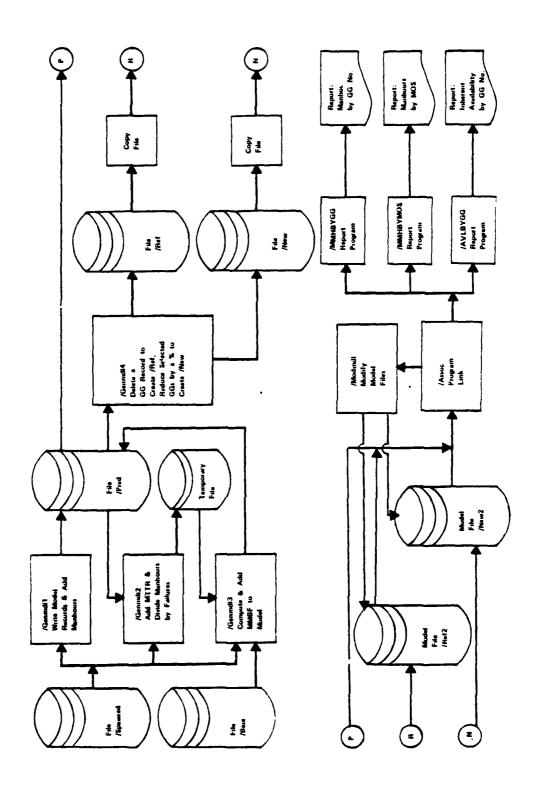


Table B1-1

EXAMPLE REPORT NTENANCE MANHOURS ARRAYED BY GG (MMHBYGG)

			2 4 8			AVE
GG NO.		æ	MAINTENANCE	72	GEN	MMH FAILURES AVE
≿			-	H		
/ED E		SYSTER	- -	500 HOURS *		AVE
IS ARRA) YGG)				300	0 <u>i</u> R	MAIL FAILURES AVE
MAINTENANCE MANHOURS ARRAYED BY GG NO. (MMHBYGG)	ESPAUS	PREDECESSOR	UNSCHEBULEB	15 ROUNDS #		
щ		<u>ت</u> . ند.	I	•		3
NTENANC		: e g.	2 2 2	15	0 Å G	# N
MA			9 1 1 0	Alles .		
			_			
			=			
			•			

			•			200		200	HOURS		72				
			•	* 11ES *							. <u></u>			FOTÁL	
		CREU			0 8 6			2 2 3							
	ž	MAIN TAILURES AV	ES AVE		FAILURES AVE	AVE	HH	FAILURES AVE	SAVE	HEE	FAILURES AVE	4	•		
7190	000.08	000.08 000.07	` :	000.15	000.07 02.1	,	000.04	000.07		000.00	000.07 000 000.27 0	00.00	0000.28		04.0
UGTB UG SUBTOTAL	900.42	000.34		000.43	000.34 01	. 2.1	91.000	000.34	00.5	000.01	000.34 0	0.00 u	0001.07	060.34 (03.1
1204	000.00	000.00 000.00	0.50	000.00	000.00	0.00	000.00	000-00	0.10	000.000					0.50
12 SUNTOTĂI	866.00	866.88 866.68	0.20	600.00	000.60 BB	0.0	000-00	000.00	0.10	600.00	000.00 C	0.00	00000	00.000	0.50
1901	000.00	000.00	01.6	000.00 001.26 000.20	000.00 000.58 000.14	02.0 02.1 01.4 06.4	000.00 000.58 000.16 000.23	888.88 888.88 888.14 888.14	00.0 01.0 01.1 02.3	000.00 000.63 000.10 000.32	000.00 000.58 000.14 000.10	00.0 01.0 00.7 03.2	0000.00 0003.41 0000.66 0001.65	000.00	02.0 05.8 04.7
1910 19 SUHTOTAL	001.51		01.	00 2.15	000-82	9.20	000.97	990.85	1.10	001.08	000.82	5.10	00005.72	000-82	0.90
2006	000.11	70.000 11.000	7.20	000.05	000.04	5.10	000.00	000.04	0.00	000.00	000.04	0.00	0000.16		0.00
20 SUBTOTAL	000.11	000.11 000.04	. 02.7	000.05	000.04	01.2	000-00	000.00	0.00	000.00	000.04	0.00	0000.16	000.04	0.10
260%	0000	\$0.000 \$0.00\$	3 01.6	000.03	000.03	0.10	000.05	000.03	9.00	000.01	000.03	00.3	0000.13	000.03	
26 SUBTOTAL	0.000	000.03 600.03	\$ 01.6	000.03	000.03	0.10	000.05	000.03	9-00	000.01	000.03	00.3	0000.15	000.03	
2800	000.05	\$ 000.06	6 00.8	000.06	000.00	01.0	000.08	000.06	01.3	000.03	000.00	00.5 00.2	00000.39	000.06	04.6
28 SUBTOTAL	000.16	6 888.17	ğ	non.20	000.17	01.1	000.11	000.17	0.10	000.00	nun.17	00.3	0000.63	000.11	63.
1075	001.14	4 000.43	3 02.6	001.15	000.43	02.6	000.61	000.43	01.4	000.43	000.43	01.0	0003.34	000.43	07.
34 3401014	1.100	001.15 000.47	ò	00 1.18	001.18 660.47 02.5	5.50	000.00	000.64 490.47 01.1	8.10	000.44	000.47	00.9	0003.45	000.47	07.

Table B1-2

EXAMPLE REPORT

MAINTENANCE MANHOURS ARRAYED BY MOS (MMHBYMOS)

E S P A # S

R	ξ	F	2
---	---	---	---

	MIL	.ES =	15 ROUNDS	= 300	HOURS =	24
PECTÂLTY	ĞŘAC	È CŘEW	OR G	DER	GEN	†OTÂĹ
123	4	******	******	******	******	******
120		*****	******			******
136	3	***** 387	******	******	******	*****.391
133	4	*****2.541	******.*12	******		*****2.553
133	Š	569.	******			*******698
138	6	*******	2			******
130		*****3.683	********	*****	*****	*****3.707
158	4	******	******	******	*****	*****
163	6	******	*****	*****	*****	******
168	. 0	******	******	******	******	4
45K	4	******.**		***** . 185	*****	*****.244
45K	5	******	********60	***** 215	*****	******.275
45K	,	******	*****.119	*****.400	*****	*****519
456	3	*****	******	***** *42	*****	• • • • • • • • • • • • • • • • • • • •
456	4	*****	*****	***** 452		*****.452
456	5	******	******	***** 425	*****	******
45L	- :-		*******	***** * 54	*****	******. • 54
454	•	******	******	*****.973	******	*****,973
63C	ż	******.**1	******	******	******	******
03C	4		******.136	******	******	***** 136
630	•	******	*****.239		*****	*****.239
63C	6	******	******.*81	******	*****	******.*81
63C		*******	******.461	******	******	******462
63 F	5	******	******	******,***	•••••	*****
6 S F		******	******	******	******	******,***

Table B1-3

EXAMPLE REPORT: AVAILABILITY BY GG NO. (AVLBYGG)

ESPAWS

INHER	ENT A	V A I L A	RILITY	
41LE5 =	15 ROUF	102 =	300 HOURS =	24
6 6 #	PRED	REF	HE M	
0190	0.996484	0.996484	U.998833	
0101	0.999960	0_999960	0.999986	
0102	0-66665	0.999692	U.999898	
0103	0.799920	0.999920	U_999973	
0105	0.999725	0.999725	0.999909	
0106	0.999401	0.999401	0.999801	
0108	0.499909	0.999909	U_999973 U_999975	
0109	0.999927	0.999927	U. 999996	
0.3	0.999996 0.999971	0.999971	U. 999975	
0300	0-999786	0-999786	U. 999818	
0301	0.999694	0-999694	0-999741	
0302 0304	0.999569	0-999569	U_999535	
0305	0.999407	0.999407	0-499497	
0300	0-999273	0-999273	U. 999384	
0308	0.799951	0.999951	0.999958	
0309	0-999759	0.999759	U_999796	
0311	0-799981	0.999981	U_999984	
0312	0.999858	0.999858	Ü.99988J	
0401	0.999833	0.999833	U.999\$33	
0.5	0.999987	0.999987	u . 999990	
0501	0.998504	0.998504	0.998848	
0503	0.099634	0.999634	0.999718	
0504	0-999951	0-999951	0.999962	
0505	0.998227	0.998227	0.978634	
0507	0.999974	0.999974	U.99498() U.999?55	
0601	0.998717	0_998717	0.999208	
0605	0.998632	0_998114	0.998909	
0603	0.999582	0.499582	U. 499758	
0607 06 08	0-998989	0-998989	U.999415	
0608	0.494478	0.999778	0.499987	
0610	0-999589	0-999589	0.999762	
0612	0.998767	0-998767	0.499287	
0613	0.999624	0.999624	0.499782	
0614	0.990105	0.990105	U. 990105	
D618	0.975503	0.975503	0.975503	
0701	0.999985	0.799985	0.499485	

APPENDIX B2

ESPAWS HARDMAN MODEL

USER'S GUIDE

AUTHOR: Alan Pincus

This document contains instructions for using the programs which maintain and report on the ESPAWS HARDMAN model.

The ESPAWS HARDMAN model consists of three primary files (Predecessor, Reference, and New), and as many secondary files as desired, using any filename, each holding a variation of the data contained in one of the primary files.

The data in all model files is organized by Government Functional Grouping Code (GG#). For a given GG#, there is one GG record containing name, number, and reliability information (MTTR, DEPENDENCY, and Mean Metric Between Failure) and multiple detail records, each specifying manhours required per associated GG failure, by Maintenance, Echelon, Maintenance Type, FCD, Specialty, and Grade.

This guide explains how to use three report programs (MMHBYGG, MMHBYMOS, AVLBYGG), a program to modify the model files (MODMDL), as well as descriptions of Time-Sharing-System (TSS) commands for file creation, deletion, and copying. For more complete explanations of TSS commands, see the TSS General Information Manual.

Creation of the three primary files is described separately. See ESPAWS HARDMAN MODEL PROGRAMMERS GUIDE.

MANHOURS BY SPECIALTY REPORT (MMHBYGG)

- 1. Logon to accounts ESPAWS2.
- 2. /MMMSYGG filename.MILEs-nnn.ROUNds-nnn.HOURs-nnn.MTYPe- SCHEduled UNSCheduled RTYPe- SUMMary
 - A. filename Required. Must be first argument after program name. It is not a file string, but a filename only, of a file in catalog ESPAWS2/DATA.

Arguments B thru F are optional and may be entered in any order.

- B. MILEs-nnn miles travelled by one vehicle in one year. Miles default = 1000
- C. ROUNds-nnn rounds shot by one vehicle in one year.
 Rounds default = 750
- D. HOURs-nnn operating hours of one vehicle in one year. Hours default ≈ 150
- E. MTYPe- {SCHEduled } determines maintenance type of report | Mtype default = unscheduled
- F. RTYPe- { DETAil SUMMary } determines report type. Detail report presents hours by four-digit GG#. Summary report presents hours by two most significant GG# digits only. Rtype default = detail

Upper case letters must be typed exactly as shown when the option is used.

Lower case are optional and may be omitted.

MANHOURS BY SPECIALTY REPORT (MMHBYMOS)

Logon to accounts ESPAWS2.

7. /MedgyMOS filename.MILEs-nnn.ROUNds-nnn.HOURs-nnn.MTYPe- SCHEduled ,RTYPe- SUMMary)

A. filename - Required. Must be first argument after program name. It is not a file string, but a filename only, of a file in catalog ESPAWS2/DATA.

Arguments 8 thru F are optional and may be entered in any order.

- B. MILEs-nnn miles travelled by one vehicle in one year.
 Miles default = 1000
 - C. ROUNds-nnn rounds shot by one vehicle in one year. Rounds default = 750
 - D. HOURs-nnn operating hours of one vehicle in one year.
 Hours default = 150
 - E. MTYPe- $\left\{\begin{array}{l} \text{SCHEduled} \\ \text{UNSCheduled} \end{array}\right\}$ determines maintenance type of report.

 Mtype default = unscheduled
 - F. RTYPe- { DETAil SUMMary } determines report type. Detail report breaks specialties down by grade. Summary report gives hours by specialty only.

 Rtype default = detail

Upper case letters must be typed exactly as shown when the option is used.

Lower case are optional and may be omitted.

INTERACTIVE UPDATE PROGRAMS (MODMOL)

- 1. Logon to account ESPAWS2.
- 2. CATA /DATA,s,a
- 3. CPY /DATA/source-filename;/DATA/destination-filename
- 4. /ASSOC name-of-file-to-be-modified
- 5. /MODMDL

EXPLANATIONS:

- 2. CATA is a TSS command that will list the files in a catalog. Since all model files must reside in ESPAWS2/DATA, by listing that catalog, you will get an instant inventory of all model files. This step is optional.
- 3. CPY is a TSS command which will copy the contents of one file into another. If the destination file does not exist, CPY will create it. This step is optional. Use it if you want to try some modifications without disturbing the files you already have. Use as a source file, the file which requires the fewest changes to be made into the hypothetical system you want to test.

INHERENT AVAILABILITY BY GG# REPORT (AVLBYGG)

- 1. Logon to account ESPAWS2.
- 2. /AVLBYGG pred-filename,ref-filename,new-filename,MILEs-nnn,ROUNds-nnn,dOURs-nnn

Arguments A thru C are required and must be entered in the order listed below.

- A. pred-filename name of file to be used as Predecessor system for this report. The file must reside in catalog ESPAWS2/DATA.
- B. ref-filename name of file to be used as Reference system for this report. The file must reside in catalog ESPAWS2/DATA.
- C. new-filename name of file to be used as New system for this report. The file must reside in catalog ESPAWS2/DATA.

Arguments D thru F are optional and may be entered in any order.

- D. MILEs-nnn miles travelled by one vehicle in one year. Miles default = 1000
- E. ROUNds-nnn rounds shot by one vehicle in one year. Rounds default = 750
- F. HOURs-nnn operating hours of one vehicle in one year. Hours default = 150

Upper case letters must be typed exactly as shown when the option is used.

Lower case are optional and may be omitted.

4. /ASSOC is a command file which makes the association between the file code which the MODMDL program uses for I/O, and a real file residing on disc. By changing this association, the MODMDL program can be made to work with any file having the proper physical and logical organization, namely, any of the model files.

This step is required and must be taken immediately before invoking the MODMDL program. If the MODMDL program begins by printing "MI?", it means that no association has been made, and the program does not know which file to work on. If this happens, hit the break key, use /ASSOC, and reinvoke /MODMDL.

Make sure that you know which file is currently associated. If you want to make changes to file B, but file A is currently associated, when you run the MODMDL program, you will be making changes to file A.

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- 5. /MODMOL The following is a description of the options available with this program.
 - LIST(L) Program will prompt for a GG#, and if found, will display its GG record, and all detail records, 20 at a time.
 - SEARCH(S) You may specify a record to be searched for which will become the current record, if found. You may specify only GG#, in which case the program will look for a GG-record. By answering "Y" to the DETAIL question, you may specify ECHELON, and/or MTYPE, and/or FCD, and/or SPECIALTY, and/or GRADE. The program will search for a Detail record with the values you have specified. If found, that record becomes the current record. If not found, the program will tell you which of the specified values could not be located.
 - NEXT-REC(C/R) The next record in the file will be displayed and will become the current record.
 - ADD(A) You may add a GG record only, a GG record and associated detail records, or detail records only. GG records are inserted in the file according to collating sequence. Detail records are appended immediately after their associated GG record.

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- DELETE(D)
- If the record is a detail record, you will delete the current record only.

 If the current record is a GG Record, all detail records associated with that GG will be deleted in addition to the GG record itself.
- MODIFY(M)
- This option allows you to modify the current record. If the current record is a GG Record, you will be presented with a list of fields which may be altered. For detail records, you may change HOURS/FAILURE only. When prompted for the new value, typing C/R will leave the old value unchanged. If a new value is input, the record will be displayed and you may choose to udpate the file or leave it unchanged.

OTHER USEFUL TSS_COMMANDS

- REMC This TSS command removes all associations between files and file codes. If after using the CPY command or /ASSOC command file, you get a message saying a file is busy, use this command and try again.
- 2. ACCE PF,/DATA/name-of-file-to-be-purged
 This TSS command will delete a file from the file system.
 You will have to use it if you run out of file space, but be careful. Once a file is deleted it is gone forever.*
- 3. ACCE MF,/DATA/name-of-file-to-be-changed,NEWNAME/new-name-of-file/

 If you want to rename a file, this is how to do it.

You may name your files anything you'd like, but only the files named 'PRED', 'REF', or 'NEW' will have neatly centered headings on their reports.

^{*}In an emergency, purged files can be restored by the operators.

APPENDIX B3 DESCRIPTION OF THE MINIMUM FLOW SOLUTION (MFS) MODEL

This appendix contains a description of the processes, use, and potential growth of the Minimum Flow Solution (MFS) model.

The MFS model is run interactively to determine personnel requirements and is based on two types of input:

- Personnel flow characteristics as derived from the EMF and
- 2. Manpower requirements for all units.

It used the following procedure for this application to determine the initial fill and subsequent sustaining rate for meeting specific manpower requirements.

- 1. Compute percentage of individuals in each AFQT category group for each MOS. This represents the likelihood of an incoming individual being in a particular category, given the current distribution.
- 2. Compute the percentage of individuals who attrite and the percent who advance from each MOS/paygrade. This can be converted to a monthly value by dividing by the average length of timein-paygrade.

- 3. Compute the average time-in-paygrade for each MOS/paygrade.
- 4. Assume that the input manpower requirements must now be met and begin to push individuals through, based on the derived flow characteristics for that MOS.
- 5. Once the highest level requirements are met, check to see that all below are met.
- 6. Compute the number of personnel which must be input per month to maintain the calculated values.

The MFS model allows for any number of paygrades within an MOS to be examined, and it provides for the elimination from consideration of paygrades which are non-existent or not to be analyzed. For example, all 13B personnel become 13Y at the E-8 level. Therefore, the model will be given orders to look at 13B only from E-1 to E-7. This can also be done if it is not desired to look beyond a particular paygrade. (Note: If there is a "0" requirement at the highest level and it is input to the model as such, there will be a value representing those personnel who are normally advanced to that paygrade simply because they cannot be held at a particular level indefinitely.)

Table B4-1 describes the prompts which occur during an execution of the model, and all of the appropriate responses which the user may provide. Most of the prompts are used for the purpose of sensitization of parameters.

Table B3-1

Instructions for the ESPAWS Minimum Flow Model:

n response to:	Enter:
MOS=	The desired MOS, or to end the program, enter nothing. An invalid MOS will cause the prompt to recur.
OUTPUT TYPE (1,2	OR BLANK) = 1 - to execute only the minimum flow portion of the program, reporting monthly recruit rates. 2 - to execute the attrite/advance percentages portion of the program on an annual basis. blank (or nothing) - to execute both 1 and 2.
CAT-PG=	Two characters specifying the sensitization to perform. The valid first characters are: P - to perturb attrite probability T - to perturb attrite time-in-paygrade V - to perturb advance time-in-paygrade M - to perturb mentality distribution. Any other character will cancel the sensitization feature (including blank) For P,T, and V, the second character is optional and must be a digit specifying the paygrade to which the sensitization is restricted. If left blank, sensitization will be performed across all paygrades. Specifying a paygrade outside the range of paygrades being analyzed will produce a do-nothing sensitization. If the first character is M, the second character is not used.
FRAC=	The fraction of sensitization. If .; is entered, the resulting sensitizations will be -10% and +10%.
#L^?ELS=	The number of paygrades which may "bleed down" in order to satisfy requirements of lower paygrades. If 0 (or blank) is engaged, the bleed-down feature is not used.
REQD=	The list of manpower requirements. Nine values, separated by commas, specifying the requirements for each paygrade. A -1 deletes the paygrade from the analysis. Each number must be followed directly by a comma or contain a decimal point.
HEADER=	A meraingful title for each of the two sensiti- zations of the mentality distribution "Alpha".
1 = 2 = 3 = 4 =	The fractions between zero and 1.0 which will be used in place of Alpha for each of the two sensitizations of the Mentality distribution. The sum of the five new values for Alpha must sum to 1.0

There are many potential expansions and adaptations of the MFS model which could and/or may be done in the future.

- By using the entire EMF, any number of MOSs could be analyzed, including a potential aggregation of all systems that utilize the same MOSs.
- By supplementing personnel demand data with personnel projection data, impacts can be assessed.
- CONUS/overseas duty rotation patterns could be derived and analyzed for their unique flow characteristics.
- School career patterns could be derived if EMF elements were updated.
- Revision of the MFS model could produce a tool which could tell personnel managers the effects of varying policy prior to implementation.

It is important to stress that there are many potential uses of the EMF data base and the MFS model. A flexible, usable data base derived from the EMF could ultimately provide users with many types of information regarding assignment and management of personnel.

APPENDIX B4 MINIMUM FLOW SOLUTION (MFS) MODEL OUTPUTS

This appendix contains all of the outputs upon which Personnel Requirements Analysis was performed. Each run was done interactively by inputting the parameters described in Table B4-1, as necessary for the type of run.

The method for determining personnel differentials is as follows. For example, for the predecessor-conceptual comparisons, an initial run was made to determine the fill and sustaining requirements for the predecessor system. Then the difference between manpower requirements of the predecessor and conceptual systems was run through the model to determine only those extra or fewer required to support the conceptual system. The conceptual system requirements were determined through the addition or subtraction of the differential personnel requirements. This was the method used in the cases of MOSs with the same highest level requirement for the predecessor and conceptual systems. cases where the highest level requirements differed, the actual conceptual system manpower values were used, since the result was the same as assessing the differential.

Included in this appendix is a page for each MOS within both comparisons: (1) predecessor-conceptual and (2) reference-conceptual.

Also included are outputs which demonstrate the capability of parameter sensitization. These outputs are primarily made to show how this analytic tool could ultimately be used

to identify ways of decreasing the personnel requirements, as well as allowing "what-if" types of questions to be answered.

The MOS 13B was used to demonstrate each type of sensitization currrently performable. No in-depth attempt was made to analyze these results at this time since they would be part of Impact and Tradeoff Analyses. However, some points to note follow:

- Changing the attrition rate by a small fraction produces more of an impact than changing the time-in-paygrade by a small fraction.
- Changing the AFQT distribution produced a change in the distribution of personnel requirements and recruit rate. Eventually this fact could be used to determine optimum distribution.

B4.1

PREDECESSOR/CONCEPTUAL COMPARISON

PREDECESSOR

```
MOS = 13B
OUTPUT TYPE (1, 2 \text{ OR BLANK}) = 1
CAT-PG=
#LEVELS=
REQD= 0,0,5832,3969,1944,1944,81,-1,-1.
MOS-13B
           REQUIRES 950.2/MO.
              PERSONNEL
PYGD
     REQ.
 E1
       0.
                23582.1
 E2
       0.
                23881.6
 E3 5832.0
                25593.4
 E4 3969.0
                11679.7
 E5 1944.0
                 3585.3
 E6 1944.0
                  1944.0
                   452.5
 E7
      81.0
                  -△ CONCEPTUAL
MOS= 13B
OUTPUT TYPE (1, 2 \text{ OR BLANK}) = 1
CAT-PG=
#LEVELS=
REQD= 0,0,1863,1944,0,0,0,-1,-1.
MOS-13B
          REQUIRES 158.2/MO.
PYGD REO.
              PERSONNEL
 E 1
                 3925.1
       0.
 E2
       ٥.
                 3974.9
 E3 1863.0
                 4259.8
 E4 1944.0
                 1944.0
 E5
                  596.8
       0.
       0.
 E6
                  323.6
 E7
       0.
                   75.3
                  +A CONCEPTUAL
MOS = 13B
OUTPUT TYPE (1,2 OR BLANK) =
CAT-PG=
#LEVELS=
REQD= 0,0,0,0,81,0,0,-1,-1.
MOS-13B
           REQUIRES
                      21.5/MO.
              PERSONNEL
PYGD
      REQ.
 E 1
       0.
                  532.8
 E2
       0.
                  539.6
 E3
                  578.2
       0.
 E4
                  263.9
       0.
 E5
                   81.0
      81.0
       0.
```

43.9

10.2

B-28

The second of the second

E6

E7

0.

MOS= 31V OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= #LEVELS= REQD= 0,0,81,81,0,0,0,0,-1.

MOS-31V REQUIRES 7.2/MO.

PYGD	REQ.	PERSONNEL
E1	ο.	149.5
E2	0.	175.0
E3	81.0	218.5
E4	81.0	81.0
Ē5	0.	42.2
Ē6	0.	29.6
Ē7	ō.	8.4
E8	o.	1.2

and the same of th

MOS= 41C OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,81,0,0,0,-1,-1. MOS-41C REQUIRES 6.6/MO. PYGD REQ. PERSONNEL 96.3 88.9 85.0 E 1 0. E2 0. E3 0. E4 81.0 81.0 33.3 E5 0. E6 0.

٥.

E7

0.

MOS= 44B OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,81,0,0,0,-1,-1. MOS-44B REQUIRES 4.5/MO. PYGD REQ. PERSONNEL 138.3 78.4 E 1 Ο. E2 0. 195.6 E3 0. E4 81.0 81.0 51.8

22.8

5.8

E5

Ξ6

E7

Ο.

0.

0.

The work of the state of

PREDECESSOR

MOS= 45K OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,81,324,243,0,-1,-1,-1.

MOS-45K REQUIRES 54.5/MO.

PYGD	REQ.	PERSONNEL
E 1	ο.	1160.9
E2	Ο.	1037.9
E3	81.0	1318.6
E4	324.0	545.9
E5	243.0	243.0
E6	Ō.	72.9

CONCEPTUAL

MOS= 45K OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= #LEVELS= REQD= 0,0,81,486,324,0,-1,-1,-1.

MOS-45K REQUIRES 72.7/MO.

PERSONNEL PYGD REQ. 1547.9 E 1 Ο. 1383.8 Ο. E2 1758.1 81.0 E3 727.9 Ε4 486.0 324.0 324.0 E5 97.2 E6 0.

to the total district of

PREDECESSOR

MOS≈ 45L OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,162,81,0,-1,-1,-1. REQUIRES 27.6/MO. MOS-45L REQ. PERSONNEL PYGD 0. E 1 621.6 0. E2 579.9 0. 622.8 E3 E4 259.6 162.0 Ē5 81.0 81.0 8.4 E6 0.

+∆ CONCEPTUAL

MOS= 45L OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,81,81,0,0,-1,-1,-1.

MOS-45L REQUIRES 8.6/MO.

PYGD REQ. PERSONNEL 0. E 1 194.0 E2 0. 180.9 194.3 E3 81.0 E4 81.0 81.0 E5 0. 25.3 E6 0. 2.6

The same of the same of

MOS= 63B OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,0,0,81,-1,-1. REQUIRES 25.2/MO. mOS-63B PYGD PERSONNEL REQ. 805.7 E 1 0. 867.6 0. E2 910.3 E3 0. 457.3 E4 0. 196.1 E5 0. 81.0 E6 81.0

PREDECESSOR

MOS= 63C OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,81,81,81,0,-1,-1. MOS-63C REQUIRES 95.8/MO.

PYGD	REQ.	PERSONNEL
E 1	0.	1788.5
E2	0.	1636.2
E3	0.	2023.7
E4	81.0	702.0
E5	81.0	198.3
Ē6	81.0	81.0
E7	0.	24.1

+A CONCEPTUAL

MOS= 03C OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,0,81,0,0,-1,-1.

MOS-63C REQUIRES 39.1/MO.

PYGD	REQ.	PERSONNEL
E 1	0.	730.7
E2	0.	668.5
E3	0.	826.8
Ē4	0.	286.8
E5	81.0	81.0
Ē6	0.	33.1
F7	Ó.	9.8

B4.2

REFERENCE-CONCEPTUAL COMPARISON

REFERENCE

```
MOS= 13B
OUTPUT TYPE (1, 2 \text{ OR BLANK}) = 1
CAT-PG=
#LEVELS=
REQD= 0,0,3888,2268,2025,1944,81,-1,-1.
MOS-13B REQUIRES 950.2/MO.
PYGD REQ.
             PERSONNEL
               23582.1
E1
     0.
       0.
                23881.6
 E2
 E3 3888.0
               25593.4
 E4 2268.0
               11679.7
 E5 2025.0
                 3585.3
 E6 1944.0
                 1944.0
      81.0
                  452.5
 E7
               +A CONCEPTUAL
```

MOS= 13B OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= #LEVELS= REQD= 0,0,81,0,0,0,0,-1,-1.

MOS-13B REQUIRES 3.0/MO.

PYGD	REQ.	PERSONNEL
E1	0.	74.6
E2	0.	75.6
E 3	81.0	81.0
E4	0.	37.0
E5	0.	11.3
E6	0.	6.2
E7	0.	1.4

~A CONCEPTUAL

MOS= 13B OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= #LEVELS= REQD= 0,0,0,243,0,0,0,-1,-1.

MOS-13B REQUIRES 19.8/MO.

PYGD	REQ.	PERSONNEL
E1	0.	490.6
E2	0.	496.9
E3	0.	532.5
E4	243.0	243.0
E5	0.	74.6
E6	Ο.	40.4
E7	ο.	9.4

REFERENCE

```
MOS= 31V
OUTPUT TYPE (1,2 OR BLANK) = 1
CAT-PG=
#LEVELS=
REQD= 0,0,81,1134,1134,0,0,0,-1.
MOS-31V REQUIRES 194.2/MO.
             PERSONNEL
PYGD REQ.
                4020.4
 E 1
      0.
       0.
                4705.1
 E2
                5875.2
      81.0
 E3
                2178.1
 E4 1134.0
                1134.0
 E5 1134.0
                 797.2
 E6
       0.
                 225.5
 E7
       0.
                  31.4
 E8
       0.
```

CONCEPTUAL

MOS= 31V OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= #LEVELS= REQD= 0,0,81,81,0,0,0,0,-1.

MOS-31V REQUIRES 7.2/MO.

PYGD	REQ.	PERSONNEL
E 1	0.	149.5
E2	0.	175.0
E3	81.0	218.5
E4	81.0	81.0
E5	0.	42.2
Ē6	o.	29.6
E7	0.	8.4
Ē8	0.	1.2

MOS= 41C OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,81,0,0,0,-1,-1. MOS-41C REQUIRES 6.6/MO. PYGD REQ. PERSONNEL 96.3 E 1 0. 88.9 E2 0. 85.0 E3 0. E4 81.0 81.0 33.3 **E**5 0. 0. E6 **E**7 0. 0.

MOS= 44B OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,81,0,0,0,-1,-1. MOS-44B REQUIRES 4.5/MO. PYGD REQ. PERSONNEL E 1 0. 138.3 E2 0. 78.4 E3 0. 195.6 E4 81.0 81.0 E5 0. 51.8 22.8 E6 0. 6.8 E7 0.

MOS= 45K OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,81,486,324,0,-1,-1,-1. MOS-45K REQUIRES 72.7/MO. PERSONNEL PYGD REQ. E 1 ο. 1547.9 1383.8 E2 0. 81.0 **E**3 1758.1 727.9 324.0 486.0 E4 E5 E6 324.0

0.

97.2

REFERENCE

MOS= 45L OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,324,81,0,-1,-1,-1.

MOS-45L REQUIRES 34.5/MO.

PYGD	REQ.	PERSONNEL
Ε1	0.	775.8
E2	0.	723.7
E3	0.	777.3
E4	324.0	324.0
E5	81.0	101.1
E6	0.	10.4

+∆ CONCEPTUAL

MOS= 45L OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= #LEVELS= REQD= 0,0,81,0,0,0,-1,-1,-1.

OS-45L REQUIRES 3.6/MO.

PYGD	REQ.	PERSONNEL
E 1	0.	80.8
E2	0.	75.4
E3	81.0	81.0
E4	0.	33.8
E5	0.	10.5
E6	0.	1.1

-∆ CONCEPTUAL

MOS= 45L OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= #LEVELS= REQD= 0,0,0,81,0,0,-1,-1,-1.

MOS-45L REQUIRES 8.6/MO.

PYGD	REQ.	PERSONNEL
E 1	0.	194.0
E2	0.	180.9
E3	0.	194.3
E4	81.0	81.0
E5	ο.	25.3
E6	0.	2.6

MOS= 63B OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,0,0,81,-1,-1,-1. MOS-63B REQUIRES 25.2/MO. PYGD REQ. PERSONNEL ٥. E 1 805.7 E2 867.6 0. Ε3 910.3 0. 457.3 E4 0. 0. E5 196.1 81.0 81.0

MOS= 63C OUTPUT TYPE (1,2 OR BLANK) = CAT-PG= #LEVELS= REQD= 0,0,0,81,162,81,0,-1,-1. MOS-63C REQUIRES 95.8/MO. PYGD REQ. PERSONNEL 1788.5 E 1 Ο. E2 0. 1636.2 0. 2023.7 **E**3 81.0 E4 702.0 E5 162.0 198.3 81.0 81.0 E6 24.1

0.

E7

A Carried Market

B4.3

SENSITIZATION EXAMPLES

Alter attrition rate by 10%.

MOS= 13B OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= P FRAC= .1 ‡LEVELS= 0 REQD= 0,0,50,40,30,20,10,-1,-1.

MOS-13B		NO SENSI	O SENSITIZATION		- 10.03		+ 10.0%	
		REQUIRES	21.0/MO.	REQUIRES	10.5/MO.	REQUIRES	50.6/MO.	
PYGD	REQ.	PERSO	ONNEL	PERSO	ONNEL	PERSO	NNEL	
21	0.	1	521.2	•	293.4	11	.26.4	
E2	0.	!	527.8	•	304.2	13	113.1	
E3	50.0	!	565.7		332.6	11	.69.3	
E4	40.0		258.1		152.2	5	37.6	
25	30.0		79.2		61.9]	14.8	
Ef	20.0		43.0		39.3		51.2	
27	10.0		10.0		10.0		10.0	

Alter attrition rate for paygrade 5 by 10%.

MOS= 13B OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= P5 FRAC= .1 \$LEVELS= 0 REQD= 0,0,50,40,30,20,10,-1,-1.

MCS-13B		NO SENSITIZATION		- 10.0%		+ 10.0%	
		REQUIRES	21.0/MO.	REQUIRES	17.5/MO.	REQUIRES	25.9/MC.
PYGD	REQ.	PERSO	ONNEL	PERSO	ONNEL	PERSO	ONNEL
Ξl	0.		521.2	•	437.9	•	543.6
€2	ο.		527.8	4	443.5	•	551.8
ε3	50.0	9	565.7	4	175.3	6	598.5
Ξ4	40.0		258.1		216.9		313.3
ε5	30.0		79.2		76.5		86.7
Ξ6	20.0		43.0		42.9		43.0
27	10.0		10.0		10.0		10.0

Alter attrite time-in-paygrade by 10%.

MOS= 138 OUTPUT TYPE (1, 2 OR BLANK) = 1CAT-PG= T FRAC= .1 #LEVELS= 0 REQD= 0,0,50,40,30,20,10,-1,-1.

MOS-13B

MOS-13B		NO SENSITIZATION		- 10.0%		+ 10.0%	
		REQUIRES	21.0/MO.	REQUIRES	23.2/MO.	REQUIRES	19.2/MO.
PYGD	REQ.	PERSONNEL		PERSONNEL		PERSONNEL	
El	0.	521.2		573.4		478.2	
E2	o.		527.8		82.2	•	483.0
E3	50.0	<u> </u>	565.7	(522.3		518.9
E4	40.0		258.1	;	268.3	•	249.8
€5	30.0		79.2		84.0		75.3
E6	20.0		43.0		45.2		41.1
27	10.0		10.0		10.0		10.0
- '							

- 10.03

+ 10.0%

REQUIRES 21.0/MO.

Alter attrite time-in-paygrade for paygrade 5 by 10%.

NO SENSITIZATION

MOS= 138 OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= T5 FRAC= .1 \$LEVELS= 0 REQD= 0,0,50,40,30,20,10,-1,-1.

303-13B		WO DEMOTITEMATION		20.00			
		REQUIRES	21.0/MO.	REQUIRES	21.0/MO.	REQUIRES	21.0
PYGD	REQ.	PERSO	ONNEL	PERSO	ONNEL		ONNEL
El	0.	!	521.2	!	521.2		521.2
E2	o.	!	527.8	!	527.8	•	527.8
Ξ3	50.0		565.7	:	365.7		565.7
€4	40.0		258.1		258.1		253.1
E5	30.0		79.2		75.9		32.6
26	20.0		43.0		43.0		43.0
E7	10.0		10.0		10.0		10.0

Alter advance time-in-paygrade by 10%.

MQS= 13B TPUT TYPE (1, 2 OR BLANK) = 1CAT-PG= V FRAC= .1 #LEVELS= 0 REQD= 0,0,50,40,30,20,10,-1,-1.

MOS-13B NO SENSITIZATION

1.100 - 200							
		REQUIRES	21.0/MO.	REQUIRES	21.1/MO.	REQUIRES	20.9/MO.
PYGD	REQ.	PERSO	ONNEL	PERSO	ONNEL	PERSO	ONNEL
El	0.	!	521.2	•	173.8	!	568.2
E2	0.	•	527.8	•	178.5	•	576.8
E3	50.0	!	565.7	9	514.2	(615.7
E4	40.0		258.1	;	248.9	;	267.3
E5	30.0		79.2		74.9		83.5
E6	20.0		43.0		41.0		45.0
E7	10.0		10.0		10.0		10.0

- 10.0%

+ 10.0%

The second secon

Alter advance time-in-paygrade for paygrade 5 by 10%.

MOS= 138 OUTPUT TYPE (1,2 OR BLANK) = 1 CAT-PG= V5 FRAC= .1 #LEVELS= 0 REQD= 0,0,50,40,30,20,10,-1,-1.

MOS-13B		NO SENSITIZATION		- 10.0%		+ 10.0%		
	_	REQUIRES	21.0/MO.	REQUIRES	21.0/MO.	REQUIRES	21.0/MO.	
PYGD	REQ.	PERSONNEL		Personnel		PERSONNEL		
21	0.	•	521.2		521.2		521.2	
E2	٥.		527.8	527.8		9	527.8	
E 3	50.0	!	565.7	!	565.7	9	565.7	
€4	40.0		258.1	:	258.1		258.1	
25	30.0		79.2		74.6		33.9	
26	20.0		43.0		43.0		43.C	
٤7	10.0		10.0		10.0		10.0	

Change AFQT distribution.

MOS= 13B

```
OUTPUT TYPE (1, 2 \text{ OR BLANK}) = 1
CAT-PG# M
#LEVELS= 0
REQD= 0,0,50,40,30,20,10,-1,-1.
OLD ALPHA:
   0.0138
   0.1008
   0.7368
   0.1471
   0.0015
FIRST SENS:
HEADER = MORE 1'S
1= .7368
    .1008
2=
    .0138
3=
    .1471
4=
5= .0016
LAST SENS:
HEADER = MORE 5'S
1= .0138
    .1008
2=
3= .0016
    .1471
4=
   .7368
5=
MOS-13B
               NO SENSITIZATION
                                            MORE 1'S
                                                                     MORE 5'S
              REQUIRES
                        21.0/MO.
                                       REQUIRES 52.3/MO.
                                                               REQUIRES 53.7/MO.
PYGD
       REQ.
                   PERSONNEL
                                            PERSONNEL
                                                                     PERSONNEL
 El
                                                                         427.7
       0.
                       521.2
                                               1398.2
 Ξ2
                                                                         403.7
       0.
                       527.8
                                               1108.3
                       565.7
 £3
      50.0
                                               2008.8
                                                                        1416.1
      40.0
 E 4
                       258.1
                                                679.9
                                                                        1013.8
 25
      30.0
                        79.2
                                                201.8
                                                                         536.9
 E6
      20.0
                         43.0
                                                101.9
                                                                         225.3
 E7
      10.0
                        10.0
                                                 10.0
                                                                          10.0
```

Change AFQT distribution.

MOS= 13B

```
OUTPUT TYPE (1, 2 \text{ OR BLANK}) = 1
CAT-PG= M
#LEVELS= 0
REQD= 0,0,50,40,30,20,10,-1,-1.
OLD ALPHA:
   0.0138
   0.1008
   0.7368
   0.1471
   0.0016
FIRST SENS:
HEADER= HIGH 1'S
1= .4
   .15
2=
3=
   .15
4=
5= .15
LAST SENS:
HEADER= HIGH 5'S
1= .15
    . 15
2*
    .15
3=
    .15
4 =
5=
    . 4
                                                                     HIGH 5'S
                                            HIGH 1'S
MOS-13B
               NO SENSITIZATION
                                       REQUIRES 36.3/MO.
                                                                REQUIRES 36.3/MO.
                          21.0/MO.
              REQUIRES
                                            PERSONNEL
                                                                     PERSONNEL
PYGD
                   PERSONNEL
       REQ.
                                                                          581.6
 El
                        521.2
                                                 813.4
       Э.
                        527.8
                                                                          530.9
 E2
                                                 698.6
       0.
                                                1195.2
                                                                         1044.6
 E3
      50.0
                        565.7
                                                                          582.2
                                                 509.6
                        258.1
 E4
      40.0
                                                 186.2
                                                                          252.0
                         79.2
 E5
      30.0
                         43.0
                                                  89.3
                                                                          117.1
      20.0
 26
                                                  IO.G
                                                                           10.0
 E7
                         10.0
      10.0
```

APPENDIX C

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APPENDIX C1 EQUIPMENT PRESENTATION FORMATS

Figures Cl-1, Cl-2 through Cl-4, and Cl-5 through Cl-7 display the hierarchical presentation formats developed for the ESPAWS predecessor, reference, and conceptual systems In the predecessor diagram, each major respectively. subsystem of the M109Al is represented by an unshaded In each reference format, equipments from the predecessor are indicated by unshaded ellipses equipments from other existing systems are indicated by shaded ellipses. (By definition, the reference system must consist of existing equipments, either from the predecessor or other systems in the DoD/NATO inventory.)

The conceptual system format is similar to the reference format with two major changes: (1) equipments which are modifications of reference equipments are represented by circles and (2) "new" equipments (indicating use of an emerging technology) which were not present in the reference system are represented by squares. Existing equipments (i.e. is equipments taken directly from the reference system without modification) are again represented by unshaded ellipses (to indicate predecessor equipment) and shaded ellipses (to indicate other existing equipment).

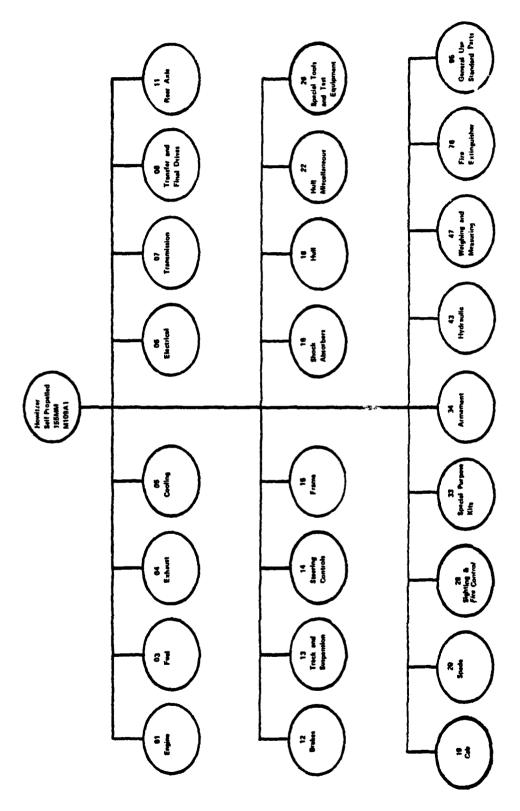
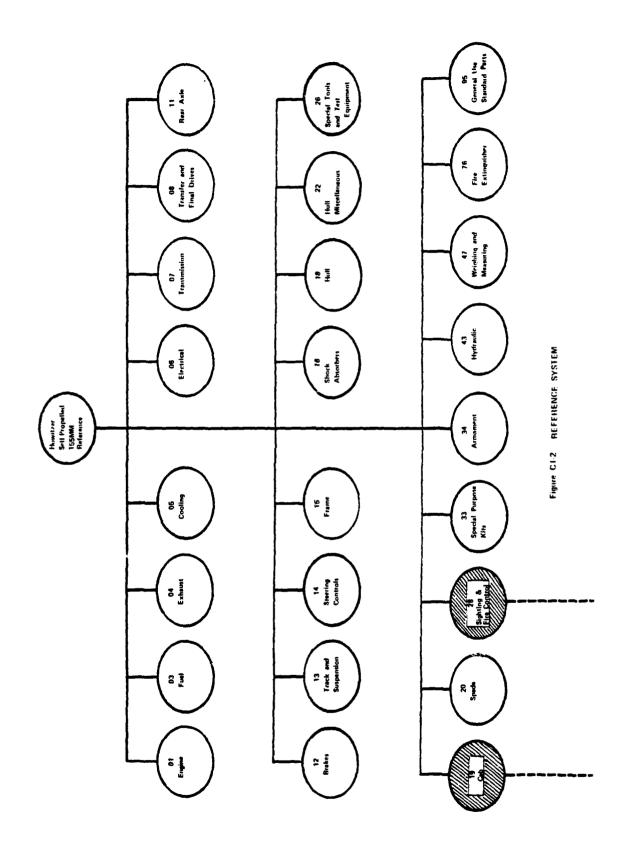


Figure C1:1 PREDECESSOR SYSTEM



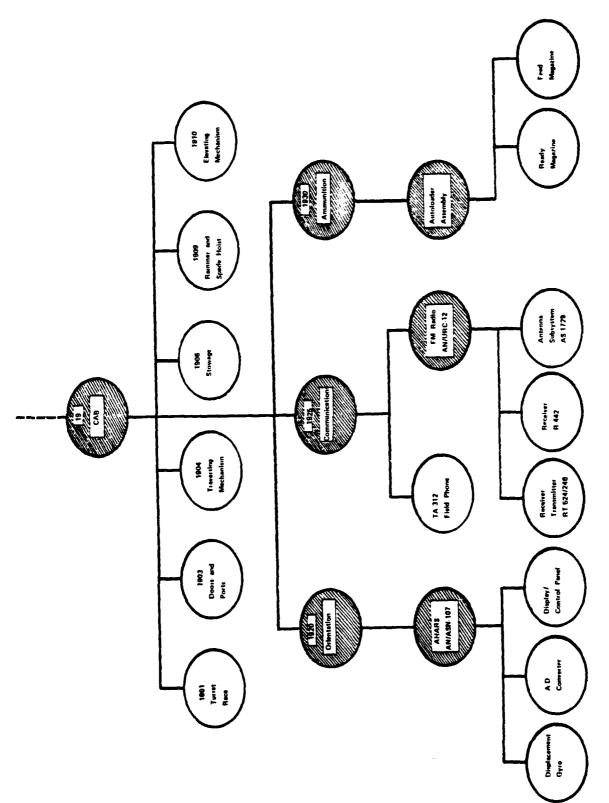
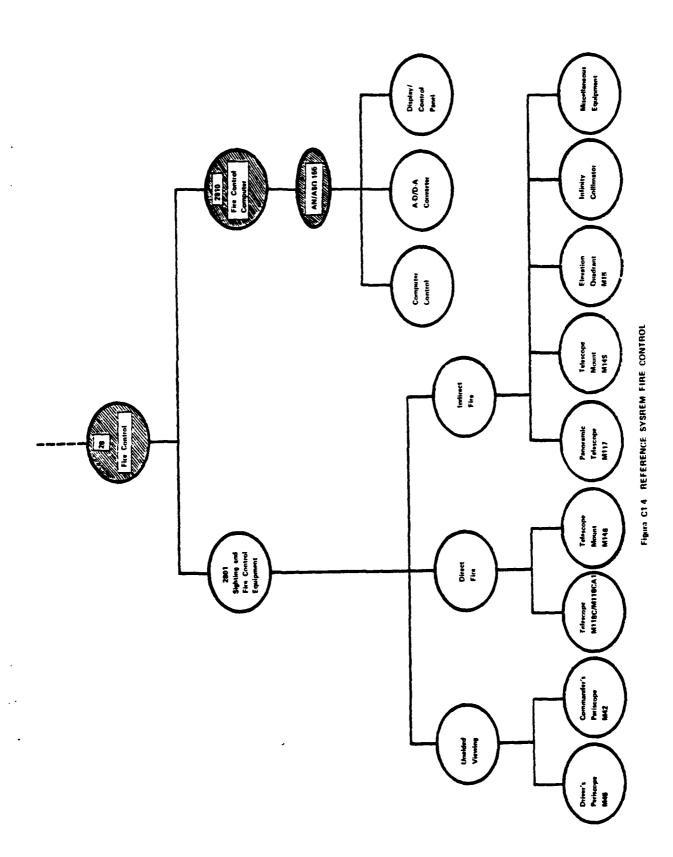
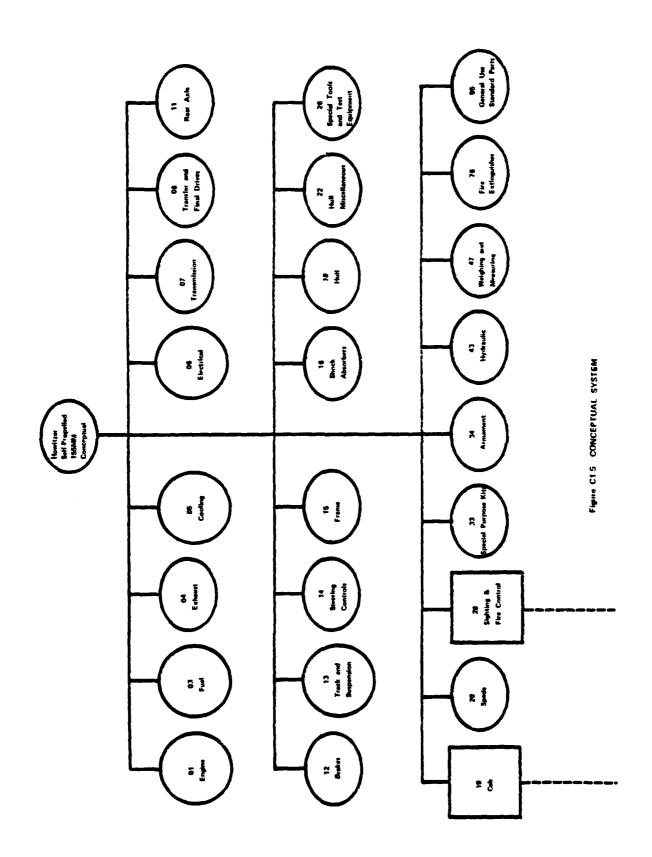


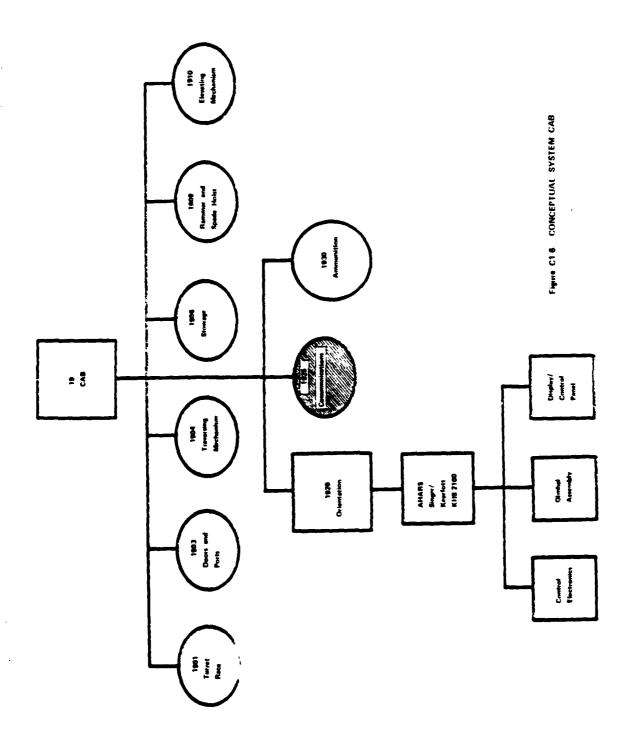
Figure C1.3 REFERENCE SYSTEM CAB

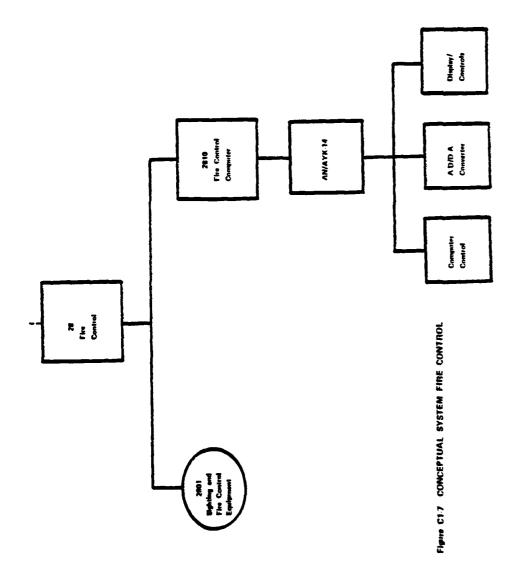
- I - ACINE



c-5







APPENDIX C2

TASK DELETION/MODIFICATION AND TASK ADDITION WORKSHEETS

This appendix describes the worksheets that were used to describe the changes in task requirements associated with the ESPAWS reference and conceptual systems. These worksheets provide a documented audit trail for the reference task modification performed in Section 8.3.2.2 and the conceptual task modification performed in Section 8.3.2.3.

The appendix is divided into two sections. The first section describes the worksheets for modifications to existing tasks. The second section describes the worksheets for the additional tasks required by the ESPAWS reference and conceptual systems.

C2.1 Task Deletion/Modification Worksheets

Tables C2-1 to C2-6 display the worksheets for modifications to the system-specific tasks associated with the reference equipments currently being maintained/operated personnel. (Tasks associated with reference equipments are considered to be task additions) The worksheets indicate which of these system-specific tasks were deleted or modified and describe the type of task deletion or task modification associated with the task Task changes related to the conceptual system change. design changes are indicated by a "C" which is placed beside the task change code. Some tasks have two reference task change codes associated with them. This occurs when the same task must be performed both with the new automated

Table C2-1. EXISTING TASK DELETION/ANDIFICATION WORKSHEET

	COMMANDER'S MANUAL	MUAL	1 1	57961	ا ا				TASK WOO. CODE	1ASK DELETION CODE	HEWEL SKULL HEW	EXIST FREQ	MFW FREG.	BUBBYLTEM	DE BIGN CHANGE NO	ADDITIONAL MEDIA	HEL. TABK CHAR. SHEET
		MITIAL EVEL	E SE	NSTITUTION	-	STITUTION DESCUSSIBILITY	1	T									
TASK DESCRIPTION	PRIMARY TRAINING Mercial	TRAINING	PNCOC AIT/OBUT	BNCCC	SGMA ANCOC	Service School	Self Study SOJT	Scheduled Training									
							ļ										
Papers a Position to Receive/Emples a Cannon	05 0 M4	-	<u> </u>				<u> </u>	<	MAS	<u> </u>	ı	1	1	System 1	1	R21 937-061-0030F R21 937-061-0031F R21 937-061-0032F Cover cemugaps and	13 di 1.
	TM 9-1016-234-12 TM 9-2350-217-10N TM 9-2300-216-10	-	ō				<	<	REL	-	-	•		Collimator		7 041-061-6081-0 (111) Airring posts and Collimator	138-R 2
Englace/Recover Ainsing Prots	FM 6-75 FM 6-81 FM 6-80 FM 6-10 FM 6-10-10-10-10-11 TM 6-10-10-10-10-10-10-10-10-10-10-10-10-10-	-	o .				<	<	REL	ı	ŧ	•	P.	Aiming Post	t	eng poorts and	138-H 2
Establish and Maintain Communications with FDC	FM 650 FM 24.20 TEC Leson 936.061.0125.F TEC Leson 936.061.0126.F	-	o			-	«	<	MAJ	4		-		System		1 936.061.0108 F Intitating and responding to radio calls.	138-8-3
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	INCUREICATION CODE. No Change in Tast Required Mense task medification in in squapment/incommidition in squapment/incommidition in squapment desirge task or shall level frequency change tame frequency change tame frequency change tame importance) change Conceptual Modification		the serve. Only minor change serve hert ensigned to different is genformed more (fers) etc	Only v	minor ch to diffi we flors!	1 1 1 1				FREQUENCY CODE 7 More than once a day 6 Morely 6 Morely 7 More to Sis times a 7 Once or twice a year 1 Less than once a year	UENCY CORE Mere than once a day Dualy Theaty Menthy Three to Six times a vear Three on twice a year Less than once a year	a a					

		i	1						TASK MOD. CODE	DELETION	SKILL SKILL LEVEL	EXIST.	NEW FREQ.	SUPTYSTEM	CHANGE NO.	ADDITIONAL MEDIA	TABK CHAR. BHEET	
	LEV	InerT	Ę	DealNill	TRAINING RESPONSIBILITY	NS/BIT	È											
	BL_		1881	METITUTION		_	1	-							_			
TASK NUMBER TASK DESCRIPTION M	PRIMARY TRANSING	BCT TRAINING	PNCOC AIT/OBUT	DNCOC	SGMA ANCOC	Service School	Self Study SOJT	Schedules Training Set!	_2-2	-								
061 206 1702 Manhor/Raley and Record FM 6-60 (2 14) Five Comments		-	0				-	<	3	ŧ	1	1	ı	System		R21 936 061 0106 F thru 13 R21-636 061 0114 F Pt 2 Writing down memory Pt 3 Reponding to memory	* # # #	
																Pr 4 Property Messages to the sent Pr 5 Sanding and recobing recognitions. Pr 6 Exert and have redit ont		
641 286 1215 Set/Lay the Camoon for Fill 6 75 (2.75) Conditions with the Range Fill 6 28 Checkman The Camoon TEC Law T	ma 941-901-9108-F mas 1190-F floru	-		<	<		10	<	1	,		•	,	Renge Ousdeant		10.1 (2) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 E	
	TM 6 1915, 224 12 TM 5-2306, 216 16 TM 5-2306, 217 1814 TM 5-1825, 209-12																	
Name of October	274.12	-		•			*	<	ij W	1	1	•	c	Range Ouedrant			# # 1	,
	TANK MODIFICATION CODE.								Ē	FREDUENCY CODE	9000							
Tash Australians 1880	Minne took multiboston test exembles		ţ	į	the same Only minus change	}			~ •	Micra Outy	Mure then once a dev Daily							
Oberge in Ministeriors Publicy SKI	Pull forus change test essentially the		i	I	were but animped to different	Į			• •	Monthly								
IC) Commence Address from	ij,	took but took in parformed muse if a reliability, etc., Look characterrates is g., difficulty	į ;		1	_			~ ~ -	Three to S	Three to the times a year Once or tweet a year Less than nouse a year	***						
ing (C) Conce	importance) change Concept at MinStheatum																	

Table C2-1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

80 8	2	COMMANDER'S MANUAL	ANUAL		FM & 138/CM	Ma/CM				TARK MOD. CODE	FASK DELETION CODE	NEW SKILL LEVEL	EXIST. FREG.	PREO.	SUBSVETEM	DE SIGN CHANGE NO.	ADDITIONAL MEDIA	REL. TABE CHAR. BREET.
			INITIA		TRAINING	JE B	TRAINING RESPONSIBILITY	TITA										
TASK PLEMBER	TASK DESCRIPTION	PRIMARY TRAIMING Meterids	BCT L TRAINING	A1170001	BNCOC	SGMA	Service School	Self Study SOJT	Schoduled Training									
001.200.1217 (2-100	Sight on a Target with a Direct FundElbor Telescope (Except ATTAAT)	FM 6-75 FM 6-88 FM 6-98 TM 9-1016-294-12 TM 9-1004	-		<	4		0	<	.	ı	1	ı	ı	Direct fire othors selectors	,	1041-041-0031-J (111) Elevation Guadrant & Effore selescope and mount	
961 264 1218 (2.19)	fire the Carmon	FM 6 75 FM 6 81 TM 9-1015-24-12 TM 9-230-216-10 TM 9-3004	-	0				-	<	3 E	j 1	+ :		I @	System	1		1 2 1 3 1 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3
(2 200	Chen Powder Chember After Fishing	FM 675 FM 681 FM 680 FM 690 FM 670 TM 91015.234.12	-	0				-	<	36	ÅŸŢ	ı	•	-	Pounder Chamber	ı		188.8.2 DEL.
(2.21)	University Construction (Separate Leading Americanists)	FM 650 FM 631 FM 638 FM 64 TM 51025.200.12 TM 8.2302.16 10 TM 8.2302.17 1	-		<u> </u>			0	<	3	t	1	1	ı	System	1	1 041 081 4130F (111) Medie of seperate lending rounds	
168 S.15.1108 CODE. El Femanson of Sec. All Test Automotion BETSF Increase in BETSF Dempi in Manitor O Other EC - Commented Addition	yslaen F neo Policy	MODIFICATION CORE. No Chaupe in Test Required More uses modification to a equipment/increasifyture the equipment/increasifyture forequenty chaupe uses forequenty chaupe uses forequenty chaupe uses forequenty chaupe uses forequenty chaupe in major uses medification importanced chaupe		the sense Only release change with but assigned to different the performed more flees) etc.	Out.	nhoor e to diff	11_			FRE 5 2 3 3 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	FRECHENCY CODE 7. More than once a day 8. Dubly 6. Westly 14. Mounth 3. Three to Six times a ver 7. Once or reice a year 1. Less than once a year	MENCY CODE More than once a day Dubly Weekly Mountably There to Six times a year Once or tentor a year Less than once a year	ŧ					

Table C2-1. EXISTING TASK INFLETION/MODIFICATION WORKSHEET (continued)

MOS 138	COMMANDER'S MANUAL	IANUAL		2	FM 8 138/CM	.	1			TASK IMOD. CODE	TASK DCLLTYON CODE	NEW BRILL LEVEL	EXIST.	NEW FREQ.	SIBSYSTEM	DFSIGN CHANGE WO.	ADDITIONAL MEDIA	REL. TABK CHAR. BHEET.
		INIT	}	TAAIN	E 08	TRAINING RESPONSIBILITY	HOLLIT	,			-							
		TAL EL	Ŧ	HETTUTION	_ '	'		UMIT					-					
	PRIMARY TRANSING	TRAINING	AIT/OSUT BCT	PNCOC	ANCOC	School SQMA	Sort Service Setect	Self Study SQJT	Scheduled Treining		 .							
Command "Check Fleing" when Unsafe Conffithers Exist	. E	-	0		1		-	4		¥	ı	ı	1	- 1	System	,		
Companeer Maintenance		-	-	_		_	-		+=							+-		T
Impact and Clean Culturator	TM B-1016-234-12 TM B-1026-206-12 TM B-2306-217-1004 TM P-2306-217-1004 TEC Lesson 041-0061-J		c	 -			<	<		3	,	1	•	m	Collimator	ı		138.R.2
Impact and Claim Aiming Posts and Might Lighding Devices	rig 716 9-1025-200-12 vg 716 9-2306-216-10 716 9-3004 78C Leson 061-081-3081-3	-	<				0	<	۲ .	Ę	,	,	-	m	Alming Posts			13p.n.2
Chamber		-	<	<			0	<	<	N N	1	,	1		Gennon Tube	ı		
		7	7	-		-	7		=	7	7	7				- 1		
CASE ALL TRUE CADE.	IAK MANIFEATION COOK									FRECH	FREGUENCY CODE	<u></u>						
Test Automaten Test Automaten Increase in MITSE Charge in Manierance Pubey	THE INC. THE COUNTY IN THE REQUESTMENT OF SERVICE THE SAME CARRY INTO CHANGE AND THE SERVICE IN SERVICE IN THE SERVICE IN THE SERVICE IN THE SERVICE SET SET SERVICE SET SERVICE SET SET SERVICE SET SET SET SET SET SET SET SET SET SE		; i	. O	y milna ved to	lafly the same. Only minor change the same but assigned to different				20\$	More than once a day Daily Weekly Monthly	veb e ex						
ICT - Conceptual Addition	FEL frequency change town tail but taik is introperate fau in change in reliability. Its: MAJ Major taik modification taik chancecini importanel change. ICI - Conceptual Modification.	task but task is performed more fin n rehtability. eft., task characteristics (a.g., difficulty,	t per t	ormed F 9.	took is performed more (bess) ity, etc. vecteristics (e.g., chifficulty,	Ī.				5 6 J	Three to Six times a year Once or twice a year Less than once a year	times a year r a year a a year						

TABLE C.2.1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

	80%	82	COMMANDER'S MANUAL	K CAL		FM6 138/CM	WO/8		1		<u> </u>	TASK MOD CODE	TACK DELETION CODE	SKILL SKILL	EXIST.	NEW FRED	SUBSYSTEM	DESIGN CHANGE NO.	ADD: FIONAL MEDIA	MEL. TASK CHAN. SHEFT
,			4	iM	-	I VIEW	2	TRAINING RESPONSIBILITY	1	≥										
			VEL	TIAL	1	INSTITUTION	₹ 2			TIMO										
	VASK MUMMER	TASK DESCRIPTION	PRIMARY FRAINING	BCT TRAINING	AIT/OSUT	PNCOC	ANCOC	School SGMA	Service	Salf Study SOJT	Scheduled Training									
	•	Amendition				-		-	 -											
	561 721 1870 (2 27)	Operate the Material Handling Haist on the MG48 Carps Carries	TM 9 2350 247-10			<u> </u>			-	•	<	NC.	ı	1	1	3	M548 Cargo Carrier	:	1 041 081-6140F (111) Introduction to Artifley Ammunition	
	061.206.1501 (2.20)	Transport Canson Ammunities on Vehicles	FM 650 TM 91300-206	-	<	<	<	-	-	۷	<	Ş.	ı		,	-	System	,		
	2051 206 1502	Prepare Camon Areanmitton	TM 66-660 !!	-		4	<		-	۷ 0	٧	ž	'	-			System			
C-14	001 206 HG4	Bere Cannas Ammastitai at a Cannon Position			4	-	•		 	<	<		AUT	1	ı		Syttem			
	12 33 (2 33)	Proper Separate Loading Ammunition for Fleing		-		<	<		<	<	<	3	1	1	1		System	,	1041 061 6140 F [111] Intro to Arithmy Ammunicitor 1041 081 1614 F Prog. Lond. Fire Heavy Arithmy Ammunicitor	138.11.6
	TASK XELETION CODE		LASK ADDIFICATION CODE.	1]	1]	1	1	{]	J. J.	FREGUENCY CODE	5						

1ASK - 2E LE TYON, CODE.	LASK, MODIFICATION CODE.
ELI Chaumation of Baboystorm	MC - No Change in Task Required
AUT 1sek Automotion	MEIN Militar Lash modification task exentially the same. Only militar change
ACTOR CAMPAGE IN SOUTH	in equipment/nomencleture required
MP Change in Manufacture Publicy	SKI Skill bend change task exemptably the same but exigned to different
O Other	REI Fronzency chance teams took but took in performed more (hest)
IC) - Conceptual Addition	trequently due to change in rehibibility, etc.
	MAJ Mayor sask modification task characteristics fe.g., difficulty,
	importance change

Table C2:1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

MOS 138	8	COMMANDER'S MANUAL	ANUAL	1	EMS 13B/CM	NO.		,		TASK CODE CODE	TASK DELETION CODE	NEW SKILL SKILL	EXIST	NEW FRED.	\$1.88VETE	DE SIGN CHANGE NO	ADOITIONAL MEDIA	NEL TASK CHAN GHEFT
			INIT	=	MIN	E BE	TRAINING RESPONSIBILITY	HIT										
		<u> </u>	TIAL EL	L	INSTITUTION	¥		3	UNIT									
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Merrick	TRAINING	AIT/OSUT	BNCOC	SGMA ANCOC	Service School	Study SOFT	Training	Scheduled								
≱ -	M109/m105A1																	
(361)	Operate an M109/M109A1 Under Normal Conditions	TM 9.2350.217-10N TEC Lesson 945-171-0100-F	-					ō	*	ž	ı		1	,	System			ı
13 639	Emplace/Recover Species on the M109/M109A1	TM 9 2350-217-10N	-	0				∢	<	2	,		,		Species			
(3 64)	Engra-Obumpage [restless 1		•	0				<u> </u>	<	ž 			'	,	Travel Lock		1041-061-6036.3 [111] Firing Jack & Trav	Lact
061 270 1501 (3 6A)	Transport Carrior American on the M109/ M169A?	FM 650 FM 688 FME 1300 206 TM 9-2360 217-109	-					0	۲ ۲	3			1		Ammunition		55	¥
061 270 1212 (3 fix)		FM 8 2360 217.10N			∢	<		0	< <	2	'	-			Direct Fire Telescope		R21 041 061-6170E [111] Bortughting the M106/M108A1	
(16.7) (17.13) (16.7) (16.7) (16.7) (16.7) (16.7) (16.7)	Brussight the Direct Fire Telescope on the M109/ M109A1 Using the Testing Target	FM 6 86 TM 9 2360 217 100N TEC Lesson 041-081 8118 F	-		<	<		0	<	*	:	ı	. +	·	Direct Fire Tebecopa		1041 061 8117 F (111) Barenighting Liden 1041 061 8119F Bossighting Direct Fire Scope	
LASK XELETION CODE		LASK MODIFICATION CODE.				1					FREGUENCY CODE	J. G.						
	Elementon of Subsystem NC Test Automation MIN	No Change in Jash Required M Minor tash mediffication Lish essentially the same Only minor change	sentially t	Ę	Only	#	change			~ •	More than Dally	More then once a day Dally						
*	Increase in Mantenance Pubey SK?	-	My the a	and and	****	2	Affrant			• •	Weekly							
C) - Contradud Addition		Frequency change same frequently due to change i Major tash modification importance? Change Conceptual Mnsification	task but task is performed more (k n refublish, est. Iask characteristics (e.g., difficulty,	ts previo	- B	nore fi	1				Three In Once or I	Three to Statimes a year Onca or twice a year Less than once a year	* P					

SOM	房.	COMMANDER'S MANUAL	MANUAL	' !	FM6 138/CM	138.	8		,		- 20	1 ASK 1 WOO O CODE C	TASK DFLETION CONDE	NEW SKILL LEVEL	FXIST FRF0.	NEW	6UBSYSTEM	DESIGN CHANGE NO	APDITIONAL MEDIA	REL TASK CHAN. SHEET
			INITIAL LEVEL	=	TRAINING	UTIO	A PER	TRAINING RESPONSIBILITY STITUTION		185						-				
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING	TRAINING	BCT	PNCOC AIT/OSUT	BNCOC	\$GMA ANCOC	Service School	TLOS	Self Study	Scheduled Training					- 71				
(3 68)	Load e Prepared Round for Fining in the M109/ M109A1	TM 9.2350.217.10N	-	0					<	<	4	MAJ +					System	:	1041 061 6133 J (111) Prefire Checks M109/ M109/A1 1041 061 6144 F Prep, Loud Fire Heavy Attitlery Ammensition	126 84 84
;												•							1041.061.6140.f Iniro 10 Artillery Ammunition 1041.061.614.f Artillery Fuses	138 A 2
OK1 270 14US (3 70)	Clean Chember Erseusto, Valves, and Marzle Brate on the M109/M109A1	TM 9.2350.217.10N LO 9.2350.217.12N	-	<					o	₹		2 5		:	:		Breech Mechanism		1041 061 8022 J MIDB Evecusion Velves and Murzie Brake	:
(3.72)	Assemble/Disassemble Breech and Firing Mechanism on the M109/ M109A1	TM 9 2350 217 10N	-						0	∢	<	N. N		i 1	:		Breech Mechanism	1 -	1041 061 6026 5 (111) Brench Mechanism	
061 276 1407 (3 74) (continued)	Operate an M109/M109A1 Under Umreual Conditions	FM 91.70 FM 9.207 TM 9.256.217.10N	-	 		4			0	<	4	NIN			1		System			
IASK JELETION CODE		TASK MODIFICATION CODE																		

1456 XELETION CODE.

Ett Etimentienn of Subryttern
AUST Feit Automation
MIRF Incree in MIRF
NP Change in Maintenance Policy
O Other
(C) - Conceptual Addition

ILASK MACKET has the control of the

Weekly Menthly Three to Six trines a year Once or twice a year Less than once a year FREQUENCY CODE
7 More than once a day
6 Daily

Table C2.1 EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

MOS	138	COMMANDER'S MANUAL	MANUA	ا	P. P	FM6 138/CM	W)]]			TASK MOD CODE	TASK DELFTION CODE	NEW SKIIL LEVEL	FXIST	NEW	SUBSYSTEM	DESIGN CHANGE NO	ADDITIONAL MEDIA	REL. TASK CHAR. SHEFT
					E	Z	10	SPON	TRAINING RESPONSIBILITY	≧										
			TIAL /EL		INST	NSTITUTION	N			UNIT	=	_								
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Mareish	TRAINING	вст	PNCOC AIT/OSUT	BNCOC	ANCOC	School SGMA	Service	Study SOJT	Scheduled Training Self									
113 S&7 1004	Racko/Takephone Operator Imtel Radio Set ANVARC 46 (ANVARC 12	TM 11-5820-401-12 TC 11-4	-		 					4	<	Z Z	1				AN/VRC IL	+		i
(3.121)	Saies) Series Radio Sal ANVRC 48 (AN/VRC 12 Series)	TC 11.6 TM 11.6920.401.12 TEC Lusson 201.113.4545.A ZG1.113.4550.E/A thru 201.113.4557.E/A TC 11.4 TC 32.11	-		 			 	0	<	<u> </u>	ž .	<u> </u>				AM/VRC 12			·
113 587 3004	Perform Operator Maintenance on Radio Sets ANVRC 46 and ANVRC 47	TM 11:5820 401.12 TM 38.750	-						a	< -	<	ž		f : 		: : .	AN/VRC 12			
551 721 1002 (3 163)	Prepare DA Form 2404 (Equipment Inspection and Maintenance Worksheet)	FM 21.306 TM 38 750 TEC Lesson 610 091 6456 F	-						0	<	۷ .	S S			1		System			
551 721 1003 (3 156) (continued)	Prepare DA Form 2408 1 (Equipment Davior or Manthly Logi Daily	FM 21 305 TM 38 750	-		-				0	۷	<	S _X	+				System			:
IASK ZEKETION CODE. Ett firmunation of Sub- AUT Task Automation MERE Increase in MERE MP Champe in Maintena O Other (C) Conceptual Addition	nystem if nnce Publicy	N. MODIFICATION CODE. No. Change in Task Requires Minor task modification to in equipment/increase/stare Staff ford fording task ford fordered change varie forquered change forquered change forquered change	of resentially the same. Only milton required to received to be same but assigned to task but task but task to performed more fin reliability, etc.	and the second s	but -	Onity Stagen	mina of to nore (diden	8 €	l	(~ ~ 60 10 4 6 6 6 1 € 1	BEG.	NIENCY CODE More than once a day Daily Weeky Weeky Thire to Six times a year Once or twice a year Lets than once a year	ee 4.					

Table C2.1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

SOM	<u>1</u>	COMMANDER'S MANUAL	AANUA	•	ž.	FIME 138/CM	N.	1			1ASK MOD CODE	TASK DELETION CODE	NEW SKILL SKILL	EXIST FREG	NEW	SUBSYSICA	DE SIGN CHANGE NO	ADIM HUNAL	REL TASK CHAR. SHEFT
			IAII LE	11	∭ ¥	DNIN	RESP	TRAINING RESPONSIBILITY	LITY		-								_
			TIAL VEL		INST	NOTITUTION	-		UNIT	=						_			
		PRIMARY TRAINING	TRAINING	BCT	PNCOC AIT/OSU	BNCOC	SGMA	Service School	Study	Scheduled Training Self									
TASK NUMBER	TASK DESCRIPTION	Meterials			$\overline{\Box}$				_										
551.721.1007 (3.168)	Perform Before-Operation Maintenance	Appropriate TM	-						•	4	ž	,	1	,		System			
561 721 1006	Perform During Operation Maintenance	Apropriate TM	-						0	< <	ž					System			
551 721 1009	Perform After Operation Maintenance	Appropriate TM	-		-				0	4	Z	,			1	System		1	-
561 721 1013	Operate Vehicle in Snow	FM 21:305	-		-				0	«	Z					System			
551 721 1014	Operate Vehicle in Sand	FM 21:305	-						0	<	ž					System		:	•
561 721 1015	Drive Vehicle Off Road	FM 21:305	-						0	4	Z Z					System		:	
551 721 1016	Drive Vehicle in Motor March or Corroy	FM 21 306 FM 65 31			-			_	c	4	2 2					System			:
551 721 1018	Drive Vehicle Under Blackout Cunditions	FM 21:305	-		<u> </u>			L	0	⋖	Ž				:	System			
(3 193)	Drive Vehicle Through Contaminated Area	FM 21.30%	-							4	2		,			i i			
551 721 1834 (3 195)	Operate the Winch on a Wheeled Vehicle	Appropriate TM	-						0	<	2					System		1 .	<u>. </u>
551.721.1877 (3.197)	Operate a Winch on an M548 Cargo Carrier	TM 9 2350 247 10	_						•	₹	2					System			
(rontinued) [ASK XELETION CODE		TASK MODIFICATION CODE		1	1	1	1]		1		ER CHENCY CODE] 5						
FLI Eteménation	Elimination of Subsystem NC	C No Change in Task Required																	
AUI Task Automation MT8F Increase in MT8	Task Automation MRN Increase in MTBF	Minor task modific, in equipment/nome	Sentially	į	Seme	Only 1	minor c	P P			- w .	Darky	A 4 3 4 3 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5						
	Change in Mantenance Policy SKI	() Shift level change task exemitably the same but assigned to different this tend	affy the	2	1	ssigned	16 5	ferent			n -	Menthly							
U Chher ICI - Conceptual Addetion	Addition REL	E.L. Frequency change same task but task to performed more (less) frequently due to change in reliability, etc.	fort tard finfishity.	1 y	zerforn.	Ē	re lless	÷			m 6	There to Sa times a	fluer to Sa times a year	****					
		MA.) Major task modification task characteristics (e.g., difficulty importance) change	k charact	Periodic	5	ŧ	why.				. -	Lets than once a year	nce a year						
	9	చ																	

- A CONTRACTOR

Table C2 1. EXISTING TASK VELETION/MODIFICATION WORKSHEET (continued)

REL TASK CHAR SHEET			e e	138 H 2	<u> </u>	: !	
ADDITIONAL MEDIA			Job Add 1041 061 8022 thru 1041 061 6036		ž.		
DESIGN CHANGE NO			Must Design Changes Related	1		i	
SUBSYSTEM			,	₹	Rammer Assembly	Hydraulic Power	
NEW FREQ				6	İ		
EXIST				1		1	To the state of th
NEW SKILL LEVEL				,			MENCY CODE More than once a day Daily Weekly Monthly Thre to Stations a year Once on twice a year Less than once a year
TASK DELETION CODE				ì	 - -		FRECUENCY CODE More than once Darby Weekly Monthly There to twee Chee or twee Less than once
7ASK MR1D CODE			¥	age .	E S	2	# ~ # # # # # # # # # # # # # # # # # #
		Scheduled Training	4	<	«	<	
	> 15 M	Self Study	4	< −	⋖ .	<	
ı	TRAINING RESPONSIBILITY	SOJT	_	₹	<	<	
,	S NO4	Service School		0	0	0	tally the same Only manot change the same but assigned to different task is performed more (fest) thy, etc.
5	E PE	SGMA		 		 	To a
FM6 13B/CM	TRAINING	BNCOC		<u> </u>			Dody.
1	TRA ISTIT	PNCOC					
	=	AIT/OSUT			 -		
UAL	INITIAL	·		-	-	-	
T'S MANI	LEVEL			-			DE. Standard Standard required Clature required test eventually the same but aveged to a same test but test to performed more fit being in reliability, etc. alon test but reactivities for difficulty, one.
COMMANDER'S MANUAL		PRIMARY TRAINING Meerish	TM 9 1015-203-12 TM 9 1015-203-12 TM 9 2300-216-20 TM 9 2300-216-20 TM 9 2300-216-20 TM 9 2300-216-20 TM 9 2004 TM 9 3004 TM 9	TM 760 116 TM 960 116 TM 9 1015 234 20P TM 9 2300 216 20 TM 9 2500 217 20N	TM 9 2360-217 20N	TM 9 2350 217 20N	No Change in Fash I Minner test modifica- Meriner test modifica- in equipment/nomen Shift level change shift level change frequency br>frequency frequenc
8 1		TASK DESCRIPTION	Perform Preventer Maintenance Checks and Services on a Howiter or Gun		Adjust the Barmer Control Assembly on the M109/ M109A1 Huesitzer	Munitain the Power Pack Hydraulic System on the M109/M109A1 Howitzer	oytum F neo Pider
WOS		TASK NYMBER	061 286 1451 (3 265)	061 266 1452 (3 7GR)	(3 284)	061 270 1463 (3 286) (cmtinumd)	Edit SELETION CODE. Ett Enmuration of Subs. AUT Task Automation MISE Increase in Manieraam O Other

Table C2-1. EXISTING 1ASK DELETION/MODIFICATION WORKSHEET (continued)

909	į																		
		CUMMANDEN'S MANUAL	AANGA			190/09					TASK MOD CODE	TASK DFLETION CODE	NEW SKILL LEVEL	EXIST FREG.	NEW	SUBSYSTEM	DESIGN CHANGE NO.	ADDITHONAL MEDIA	HEL. TASK CHAN SHEET
			INI		Į ž	INING	TRAINING RESPONSIBILITY	NSIBAL	≧	Γ									
			TIAL VEL] -	NSTIT	INSTITUTION	_		C I	-					_			-	
			TRAINING	BCT BCT	PNCOC AIT/OSL	BNCOC	SGMA	Service School	Self Study SOJT	Schedule Training									
TASK NIMBER	TASK DESCRIPTION	PRIMARY TRAIMING Meterish			-					d								-	
(3.288)	Repair Components of the Hydraulic Power Pack in the MTON/MTOSA? Howitter	TM 9-2360-217-20N TM 9-2350-217-20P-2 TM 9-2350-217-35972	-			 	<u> </u>	0	<	4	ž		,	1	1	Hydrauth: Power Pack	ı		
(3.291)	Bleed and Cherge the Elevating/Equilibrating Hydraulle Systems of the M109/M109A1 Houdtzer	TM 9.2350.217.20N	-			 	 	0	 	<	2					Equilibrating System			
(3.2%)	Repair of Components of the MIDD/MIDBA1 Howitzer Cab Electrical System	TIN 9-2360-217-20N TIN 9-2360-217-20P-2 TIN 9-2360-217-26P/2	-					0	<	<	MIN	1 1	1 ,	l un		Electrical	¥ 900	f	
061 270 1467 (3-295)	Replace Sciencid or Combined Sciencid and Hydraulic Motor Bypers Valve in th M109/M109A1 Moreizzer	TM 9.2360.217.20N TM 9.2360.217.20P.2 TM 9.2360.217.25P/2	~					0	<	<	2		,	,		Solemoid	:		
(3.29.) (3.29.) (cuntened)	Replace Solemoid or Combined Solemoid and Rammes Control Valve in the M109/M109A1 Howettee	TM & 2360.217.20N TM 9 2360.217.20P.2 TM 8 2360.217.25P/2	-					0	<	4	MAJ REL(C)	1 (1 1		- 2	Solenoid	MOS 4		138 E.1 138 C.1
IASK JELETION CODE		TASK MODIFICATION CODE		1		1			1										
	system	-					-				¥ ,	FRECHIENCY CODE	Ş						
AUT Test Automation MTBF Increase in MTB	•		_	Ę	3	A A	the same. Only manor change	ş.			•	Marie Ihan once a day Daily	orfice & day						
Oberne in	Change in Maintenance Pulicy SKI	i . Skill level change task exemially the skill level		2	¥	pauli	some but assigned to different	Inel			₽	Workly							
(f) - Conseptual Addition	Addition	L Frequency change same task but task is performed more ffrss) frequently due to change in reliability, etc.,	but task lability, a	E ž	rform	g more	(Fas)					Three to Sta	Three to Six times a year	•					
		£	lask characterities to g., difficulty,	Witties	<u>;</u>	diffical	ž				۰-	Unce no twees a year Less than once a year	10 a year						
	5	IC) - Conceptual Medification																	

Table C2.1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

MOS	136	COMMANDER'S MANUAL	AANUA		# N	FM6 138/CM	2	1 1		L	TASK MOD. CODE	TASK DELETION CCDE	NEW SKILL LEVE!	EXIST FREO	NEW FREO.	SUBSYSTEM	DESIGN CHANGE NO.	ADDI FIONAL ME DIA	REL TASK CHAR BOUFT
			INITIA	*	TRAINING	NING	RESPON	TRAINING RESPONSIBILITY	2 5			_							
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Mensish	TRAINING	AIT/OSUT	PNCOC	BNCOC	School SGMA	SOJT Service	Self Study	Scheduled Training									
(3.298)	Replace the Manual Elevation Accumulator Assembly in the M109/ M109A1 Howitzer	TM \$-236-217-208- TM \$-236-217-208-2 TM \$-2350-217-28872	-					¥ 0	4	4	ž	í	i	,	,				
081 276 1470 (3 301)	Repair Gunner's Control or Cab Power Pack Tubes and Fittings to Gunner's Control on the M109/ M109A1 Houston	TM 9-2360-217-20W TM 9-2360-217-20P-2 TM 9-2350-217-25F/2	-					C	<	<	2	1	1	'		Gunner i Control		:	
061 270-1471 (3 303)	Check the Mein Accumulator Nitrogen Precharged Pressure in the M109/M108A1 Howitzer	TM 8.2359.217.20N	-					0	<	<	Z	ì		'		Men Elevation Accumulator			
(3.304)	Replace Sobrood or Combined Solenoid and Elevation Selector Valve in size M109/M109A1 Headton	TM 9.2360.217.20N TM 9.2350.217.20P.2 TM 9.2350.217.25P/2	-					0	<	<	N N	-	,	1		Solemoid			
(3.306) (3.306) (rentitued)	Repair Hydrauft. Tubes end Fittings to Ebustion and Equilibrator Systems on the MIDS/MEIDS/1 Howelter	I IM 9.2360.217.20N IM 9.2350.217.26P/2 IM 9.2350.217.25P/2	-					0	₹	~	ž	,	,	ı		itydraule: Tulber			
1486 SELETION CODE. ELI Elementorio Sabbra AUT Test Autometion MEST Increase in MEST ME Change in Metalemen O Their ELI Conceptual Addition	rea Puber	NAMORECATION COOK. No Change in Task Requires Manou and modification to in quajoment/homoschalture Ball Bred change tesh vital Frequently change same frequently change same frequently change and frequently change frequently	is essentially the same. Only relinor required to tentially the same but strigged to task but task to performed more line characteristics for a difficulty, test characteristics for a difficulty.	yerse	hut as riforms teg.	baky mi ligned d mor	utistly the same. Only minor change of the same but assigned to different it sale is performed more lies) with, set, difficulty.	8 11 0			F ~ * * * * * * * * * * * * * * * * * *	FREQUENCY CODE Mere than once a day Merethy Menthy Mere then once a day Mere then once a day Mere to Mere to Sta times a year Mere or twice a year Mere or twice a year	į						

Table C2-1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

ALTIONERS AND	1	2006	IEVEL	FREO	FRED	SUBSYSTEM	CHANGE	ADDITIONAL MEDIA	CHAR.
Self Study SQJT Service School SGMA ANCOC BNCOC PNCOC AIT/OSUT									
Self Study SQJT Service School SGMA ANCOC BNCOC PNCOC AIT/OSUT									
	Schoduled Training								
< 0	A RELICI	, (i 1	' m	,	Cab/Turnst Wiring Harness	106 A		138 C.1
0	!	(1	ŀ	·	Breech Mechanism	,	1041-061-6026.J {???} Branch Machanizesian	
							1		1
<	¥	1	1	•	m	Bystem	,		数 4 5
	\exists		1				7		
MODIFICATION CODE. An Change in Task Required. Mann telm modification that necessary is some Only minor change in equipment/homeoclassers required. Mill level change task resentially the same but seriogned to different this level change uses testified to entire things uses testified to the change in relability, set, Requiredly modification test change in relability, set, mannered change meantered change meantered change	# v # # 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	MUENCY COD Muter than on Dually Weekly Menthaly There to Sir Ours or terior	oce a day limes a year limes a year limes a year						
	the same Only minor change are but prigned to dillerent is performed more lies; tc., intres (e.g., deflicably,			7 7 8 6 9 7 2 2 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	7 7 7 8 6 6 7 7 8 6 6 7 8 8 8 8 8 8 8 8				

Table C2-1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

MOS	136	COMMANDER'S MANUAL	ANUAL		FM& 138/CM	38/CM		1		7ASK MOD. CODE	7ASK DELETION CODE	NEW SKIILL SKIILL	EXIST	NFW FRED	SUBSYSTEM	DESIGN CHANGE NO	AUDY FIGHAL MEDIA	REL FASK CHAR BHEET	
			INI.	∭_	IBAIN	NG RE	TRAINING RESPONSIBILITY	MEST		_									_
-			TIAL /EL	Ē	INSTITUTION	3			1381	-									
TASK MIRARER	R TASK DESCRIPTION	PRIMARY TRAINING Maintin	TRAINING	AIT/OSUT 8CT	BNCOC	ANCOC	Service School SGMA	Study SOJT	Scheduled Training Self	Cabachata 1									
041 248 2223 2-40 REL	Alline Collinator/Alaning Posts	FM 6.15 FM 6.81 FM 6.80 FM 6.8	~			<		6	<	a	3	ı	•	m	Collimator/Alenten Ports	1	Luying to Deflection R. 1 Bass 1041 061 6106 R. 1 Alies on Collimator 1041 061 4106 Luying for Deflection 1041 061 4106 Luying for Deflection 1041 061 4106 Luying for Deflection P. 3 Alies on Aiming	136.4.2	
(2 42)	Boreright the Pandeamic Tehroope with the M140 Alinement Device	786 Lerson 041-021-67-6	~					6	<	ž	ſ	!	1		Penosamic Telescope	,	Total 081-6118F Boresighting Patoramic Telescope		
(continued)																			
J		×								ž	FREQUENCY CODE	1		<u> </u>					_
AUT Task Au	Elementation of Subsystem NC Task Automateun MRM	: No Change in Task Required. 19 Milton task modification task executisity the same. Only minor chause	mittelly of	§	Š	Minor					More than once a day	nce a day							
2		•	P				,			• •	Daily								
	Change in Montengoice Policy ST.			Ĕ		2 E	Miren			•	Monthly								
•		Frequency change same frequently due in change	but task ability, eth	i perf	Paul	MOre (H	1			e &	Three to Six times a year.	times a yes	ŧ						
		Major task modification importance change Concentual Modification	task characteristics fe.g., difficulty,	istics f	₹ I	Heathy.				-	less than once a year	mak e es							

Table C2:1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

HEL. TASK CHAM. SHEET.			138 R 2 138 R 12		
ADOITIONAL MEDIA			1941-061 6100F [111] Laying for Deflection Pt 1 Through Pt 4 014 061 6107F		
DESIGN CHANGE NO.				i	
SUBSYSTEM			Syllem	Parotame	
NEW			m	;	
EXIST. FREO.			▼ 1	1	
NEW SKILL LEVEL			1 1	ı	nce a day times a v a a vear
TASK DELETION CODE			1	1	FRECUENCY CODE 7 More than once a day 8 Meethy 6 Meethy 4 Monthly 3 Three to Six times a year 2 Once or twice a year 1 Less than once a year
TASK MOD. CODE			MA	QQ	THEO THEO
IANUAL FIME 138/CM	TEALINI TRAINING RESPONSIBILITY INSTITUTION UNIT	Scheduled Training Self Study SOJT Service Ser	<	<	EDDIFICATION CODE. More task Required More than the same only relater change in equipment/incontendature required to equipment/incontendature required to the same only relater change task essentially the same but excipated to different blad head change task essentially the same but excipated to different frequency change tasks to be the same task but task it portermed move fless) frequently due to change in reliability, etc. Hoperand change International change
COMMANDER'S MANUAL		PRIMARY TRAINING Meresist	FM 6.75 FM 6.81 FM 6.81 FM 6.89 FM 6.90 FM 9.90 FM 9.9		I AME MODIFICATION CODE. No. No Change in Trait Required MBH Minor task modification test ensuring SKI Shill found change task ensentially shill level REL. Frequenty change task ensentially shill level MAJ Major task modification task both importance change in reliability importance change in reliability importance change.
MOS 138		TASK NUMBER TASK DESCRIPTION	061 286 2229 Set/Lay the Cannon for [2 439 Deflection	Sight on a Target During Object Fire with the Panoramie Telescope Panoramie Telescope	1245. XLETION CODE. E11 - Elemination of Substrien AUT - Tale Audomation MTBF - Increase in MTBF MP - Change in Mantenance Fullcy O - Other (C) - Canagemed Addition
		7 A&K	2 439	(2.45) (2.45) (2.45)	108 MIN WILL WALL WALL WALL WALL WALL WALL WALL

TANG C2.1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

SOM	951	COMMANDER'S MANUAL	ANUAL		FM6 138/CM	38/0	3				TABK MOD. CODE	TASK DELETION CODE	NEW SKILL LEVEL	EXIST. FREO.	NEW FREG	SUBSYSTEM	DESIGN CHANGE NO.	ADDITIONAL MEDIA	REL TASK CHAR GHAR
			INIT		TRAI	S S	RESP	TRAINING RESPONSIBILITY	Ž		-								
			TIAL /EL	=	INSTITUTION	17108	_		5	CHRIT									
TASK HIMBER	TASK DESCRIPTION	PRIMARY TRAINING Metrich	TRAINING	AIT/OSUT BCT	PNCOC	BNCOC	SGMA	Service School	\$0JT	Training Self	Scheduled								
081 266 2731 (2-48)	Rader the Place	FM 630 FM 675 FM 681 FM 690 FM 694 TEC Leron 041:0614113.F	~			<u> </u>			0	<	<u></u>	,	1		m	System System	;		4
	M109/M109A1					<u> </u>			_										
061 270 2725 (3 77)	Boreright the Paroramic Telescope on the M108/ M108A1 Using a Distant Alming Point (DAP)	FM 8.256.217-10N	N						`	«	BE BE	t	1	•	es .	Panoramic Teluscope	ŧ	R21 041 061-4170E Borerighting M108/ M108A1	138 R 2
(3.78)	Bo oright the Percentic Telescope on the M109/ M109A1 Using the Testing Target	Fin 686 TM 9.256.217.16W TEC Lenon 041-061-6118-F	~						0	<	ž	1	ı	•	m	Panos amis Talascopa	ı	R21 041 081 6130E Boresighting M109/ M109A1	188.8.2
LASE XELETON CODE. E11 Elemination of Social AUT Test Automation BESS Increase in MTSS NR Change in Ministration Office Conceptual Addition	res Policy	MODIFICATION CODE. No Chemps in Task Request Minor task modification: the requestivens/frommorbitum State level champs task their break requestive champs to champs frequently due for champs frequently due fo	of an experiency the same Only minor required to experience the same but assigned to a task but task to performed more for in standardity, sec. to difficulty, task characteristics (e.g., difficulty,	The second secon		A man de	in the state of th	letem letem	_	-		FREQUENCY CODE 7 More than once Daily 6 Weekly 4 Monthly 3 Three to Sir tile 2 Once or twice i	NUENCY CODE More than once a day Daily Weekly Monthly There to Six times a year Once or twice a year Less than once a year						

Table C2-1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued) .

NEL. TASK CHAR. SHEET			136 A 2					
ADDITIONAL MEDIA			1041-061-4110F Establishung Alming Points	204 1 65 4080 A Livy Battery by Alming Point, Deflection 2041 661 6091 A Sport Adjusted Deflection 2041 681 6092 Leying Rattery and Manuacing and Reporting		2011 061 4017.A Verify place crest range	2041-081-8083-J Leying Battery and Measuring and Reporting	
DESIGN CHANGE NO								
SUBSYSTEM				Marken Marken	System	System	Syrtem	
NEW FREO						1	1	
EXIST. FREO						1	ı	į
NEW SKILL LEVEL				ı	-	4	ı	DE once a dev co a year
TASK DELETION CODE				1	1	1	1	FREQUENCY CODE 7 More than once a day Douly 6 Weshly 7 More to Six times a year 2 Once or twice a year 1 Less than once a year
TASK MOD. CODE				REL	N N	NC	MAJ	7 FRED
			Scheduled Training	<	<	۷ .	∢	
	ځ	LIND	Salf Study	4	۷	٧	4	
1	TRAINING RESPONSIBILITY	_	SOJT		0	<		p E
1	ESPOR		School SGMA					affy the same. Only minor change the same but assigned to different task is performed more (fest) ty, etc recteristics fe g., defficulty,
3	5	₩0	ANCOC	۷ 0	▼	<	۷ 0	affy the same. Only minor chi the same but assigned to dille test is performed more (less) ty, etc recteristics fe g., difficulty,
FM6 13P/CM	Afr	INSTITUTION	BNCOC PNCOC	0	٨	0	0	6 m
F. P.	=	INST	AIT/OSUT		_			Par p
			ВСТ					
N N	INIT	FIAL EL	TRAINING		8	6	3	Charles to the first to the fir
COMMANDER'S MANUAL	UEV	EL	PRIMARY TRAINING	FM 650 FM 611 FM 618 FM 618 FM 618 FM 690 FM	FM 6.50	FR 650 FR 621 FR 681 FR 689 FR 690 FR	FM 6 25 FM 6 25 FM 6 82 FM 6 86 FM 6 96	IASK MCDIFICATION CODE. No. No Change in Test Required. MMN Minor issue modification task servicely the same. Only minor change in equipment/fromenclature required. Skil Skell keet change rask exemisely the same but assigned to different stall keep. All there change same task but task is performed more (lest) requestey change same task but task is performed more (lest). MAJ Major sak modification task characteristics (e.g. difficulty, importance) change in reliability. etc
961			TASK DESCRIPTION	Vurity Emplocement of Alaming Points and Recording of Deflections	Control Movement of Vehicles Within a Position	Paternaine Site to Crest	Render Required Reports to FDC	vatern nce Policy
MOS			TASK NUMBER	061 266 3304 (2.8)	061-305-6002 (2-8)	061-246 3305 [2 9]	061 266 3312 (2 12) (2 00)	145K ELEIION COOE. ELI Flormation of Safrin AJT Test Automation M186 Increase in M188 MP Charge in Wantenson O Other (C) - Concerptual Addition

Table C2-1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

MUS	8 1	COMMANDER'S MANUAL	IANUAL		FM6 136/CM	38/Ct		, [}		TASK NVOD. CODE	TASK DELETION CODE	NEW SKILL	EXIST.	NEW FRED	RURSYSTEM	DESIGN CHANGE NO	ADDITIONAL MEDIA	REL TASK CHAR. SHEFT.
			INITIAL LEVEL	N.	TRAINING	NO.	TRAINING RESPONSIBILITY		CINST										
1ASK MANGER	TASK DESCRIPTION	PRIMARY TRAINING Merrish	<u></u>	AIT/OSUT	PNCOC	ANCOC	School SGMA	SOJT	Self Study	Scheduled Training								R21837 061 0030F	
061 202 1002 (2 13)	Camouflage/Coresal Equipment	FM 5-20 FM 7-7 TEC Lesson 937-081 0030-F	м		<u> </u>			<	٧	∢	Ş	i				System	1	R21937 061-0031F R21937-061-0032F Corer, Camoflage and Concesiment	
061 266 3313 (2 15)	Prepare a Runge Card for a Camion	FM 450 FT 106H7, C2 FT 156 AM1, C2			<		-	0	<	<	N	-	,	 	-	System	1		
061 266 3314 (2.17)	Direct the Personnel of the Camon Section During Indirect Fire Missions	FM 650 FM 675 FM 681 FM 698 FM 690 FM 690 FM 694 ARTEP 6165 ARTEP 6165	er		0			<	∢	<	MAJ	i	i			System			41. R R. 14
061 266 3315 (7 19)	Determine that the Weapon is Safe to Fire	FM 650 TEC Letton 041:081:8019:A	m		0	5		<	<	<	NC		,			System		1041-061-8019A Determine Weapon Safe to Fire	
061 266 3318 (2.21) (continued)	Conduct File on Prentinged Targets	FM 650	P)		0			<	<	∢	MIN	·	÷	,		System			
LASK SEELION CODE. Ell finmasten of Sept. AUf rat Automatom MIBE increase in MiBE Of Darry in Maintena Of Other (C) - Conceptual Addition	ys an mean of the control of the con	MODIFICATION CODE. We change in Task Required Minor tash modification to in equipment/frommer/letters Skill keed change task at All keed Frequently change same frequently due to change in frequently due to change inspectional change important change Conseptual Modification	it essentially the same. Only minor required to tentially the same but assigned to tentially the same but assigned to nestablity, etc. I nestablity, etc.	the same but is perfected.	n. Ond Cassing Vimed F.g., Gi	iy min ned 1c mare Aficulti	of chan of differences (fers)	<u>₽</u> <u>E</u>			F ~ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	FREQUENCY CODE More than once a day Daily Wherety Monithy There to Sha times a year There to their once a year Less then once a year	DE nines a day himes a year ee a year	<u>.</u>					

Table C2:1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

Part	, SOM	18 18	COMMANDER'S MANUAL	ANUAL	ا ا	FM6 138/0M	98/OR			,		TASK MOD CODE	TASK DELEFION CODE	NFW SKILL LEVEL	EXIST	NEW	SUBSYSTEM	DESIGN CHANGE NO	ADDITIONAL	REL TASK CHAR. SHEFT	
### ### ### ### ### ### ### ### ### ##				INITIAL	I INS	NA TIT	Ş S	ESPOR		Z Z											
### ### ##############################	TASK NUMBER						L		Service	Study	Training			*****					1041 061 6014 A 1041 061 6015 A 1041 061 6016 A		
Chartent Micromiter Fig. 6-15 Char	061.266.331? (2.22)	Execute Zone and Sweep Fire Missions	FM 650 TEC Lesson 041-061 6014-A TEC Lesson 041-061 6016-A TEC Lesson 041-061 6016-A	м		-				ļ	<u> </u>	S Z	1	1	!	· · · · · · · · · · · · · · · · · · ·	System		Compute Zone Fire Mission Compute Sweep Fire Mission Compute Sweep and Fire	138 R.2	~
Chardrant End for End Test Fix 695 Fix 696 Fix 696	041.266.3110 (2.23)	Perform Gunner's Quadrant Meconneter Test	FM 6.75 FM 6.81 FM 6.90 FM 6.90 FM 6.90 FM 6.90 FM 2.300.216.10 TEC Lesson 641.061.8101.F	е.		ō .	4		-		<	REL	1	1	•		System	4	1041-051 6101 F & 1041-051 6102 F Test of Guerer's Guedent, Part 1 A 2		
FREC State CODE LASK MCDIFICATION CODE	(2.24)	Perform Gunner's Charlesst End for End Test		m		0			<u> </u>		<	REL		1	•		System	i .		136.4.2	N
FRECEION CODE. LASE MODIFICATION CODE. FRECEION CODE.	(continued)			\dashv	\exists	\dashv		-	\dashv	_											\neg
	LASK ELETIO ELL Firmmater AUT fink Am MIBF increase MT Output O Other	res Pokev	3	red fed By the sa but tesk i ability, ett	he samt time but to perfo	P Only	Y min nore ficults	or chair t differ Y	* •			# ~ # W # W ~ +	GUENCY CO More than in Daily Weekly Monthly There to Stat Once or twee	nce a day limes a ye y a year							

Take C2:1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

REL. TASK CHAR. SHEET.				136 A 2	138 R 2	1			
ADDITIONAL MEDIA				Arimuth		1	1041-061-6130F Mistise of Seperate Loading Rounds		
DESIGN CHANGE NO				i				ı	
SUBSYSTEM				Gunner's Quedrant	Gundent Quadrent	Syttem	System	System	
NEW FREO				m	9				
EXIST FREO				•	•		;	-	- - -
NEW SKRLL SKRLL				ı	ı		1	ı	DE a day crimes a y cr
TASK DELE TION CODE				1	,		-	ı	FREQUIENCY CODE 7 Mons than once a day 6 Daily 5 Weekly 4 Monthly 3 Three in Sis times a year 2 Once on tweer a year 1 Irst than once a year
TASK MOD. CUDE				REL	REL	Ç	N C	N	F
AL FM6 138/CM	TRAINING RESPONSIBILITY	INSTITUTION	Scheduled Training Self Study SOJT Service School SGMA ANCOC BNCOC PNCOC AIT/OSUT BCT	< < <	< < <	< <	< < < < < < < < < < < < < < < < < < <	4 4 V	SODIFICATION CODE. Memor last modification to a seemilably the same Only retror change in equipment/momentature required. Shall beed change task exemilably the same but assigned to different last exeminably the same but assigned to different frequency change same task but task in performed more (less) frequency change in reliability, etc. Major task modification task characteristics (e.g., difficulty.
MANU	LEV	IAL EL	TRAINING	е	m	e	F	3	r essend repaired repaired refabilit
COMMANDER'S MANUAL			PRIMARY TRAINING Metrials	FM 675 FM 681 FM 694 FEC Lesson 041-061-8183 F	FM #75 FM 681 FM 688 FM 694	FM 6 86 FM 6 75 FM 6 48 FM 6 89 FM 6 99 FM 6 99 TM 9 1015 234 12	FM 650 TM 9.1015.234.12 TM 9.236.217.10W TEC Lesson 041.061.6130.F TEC Lesson 041.061.8131 F	FM 650	3 -
138			FASK DESCRIPTION	Set/Lay for Ouadrant with the Gurner's Chudrant	Measure the Quadrant with the Gunner's Quadrant	issee Fire Order for Direct Fire	Take Inmediate Action for Minister	Direct the Personnel of the Cannon Section During Displacement	nythem F nce Policy
NON			TASK NUMBER	(2.26) (2.26)	061 266 3119	156 33.00 156 33.00	(2.31)	061 286 3322 (2 37) (continued)	1455 X.E.110M CODE. Fil Elementon of Sude AU Fast Automation MTBF Increase in MTBI MP Change in Maintena O Other; [C] Conceptual Addition

Table C2.1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

` } ;		•	-1	M6 138/CM	38/CM	MESPONSIBILITY	PONSIBILITY		11 = 1	_		TASK MOD. CODE	TASK DELETION CYDE	NFW SKILL LEVEL	EXIST FREG	NEW TREQ.	SUBSYSTEM	DESIGN CHANGE NO	ADDITIONAL MEDIA	REL TASK CHAB. BHEET
ANCOC BNCOC AIT/OBUT BET TASK DESCRIPTION MARKER TASK	SCT TIAL TRAINING VEL HERE 184	вст		PNCOC	[≒] BNCOC i	E ANGOC	SGMA ANCOC	School	SOUT	Self Study	Scheduled Training				-					
Maintain DA Form 2408-4 TM 38 750 3	TM 38 750 3	3				-			-	4	∢	ğ	-	ı	-	1	System	;		
Mercom Crater and Shell FM 6-121 3 A Fragment Analysis	•		*		<					<	0	ž	1	ı	'	1	System	ı	1243 0&1 0200F 1243 0&1 0102F Creter Analysis Parts 1 & 2	
Verify Boresight FM 688 3 A Performed on th M109/ TM 9.2350.217.10N M1094 and M1094 TEC Lessons O41.061 6117.F thru O41.061 6117.F Thru O41.061 6119.F	FM 688 3 TM 9.2350.217.10N TEC Larsons 041.001 6113.F thru 041.001 6118.F	e	∢	∢	∢					0	۷	ž					Tosting Target	,	R21041 061 6170E Boresighting M109/ M109A1	, ! !
Perform Preventive TM 9-2350-217-10N 3 A Maintenance Checks and LO 9-2350-217-12N Series on the MT09/ M109A1	m		∢	<	∢	1			0	<u> </u>	<	MAJ	ı	ı	:		64 stem	Almost All Design Changes Ase Related	1041 061 6022 thru 1041 061 6036 M109/M109A1 Crew Maintenance	31 8 NE.1
Prepare the M109/M109A1 FM 9 207 for Operations Under TM 9 2350 217 10N Thurstad Conditions FM 31 70 TEC Letton 945 171 0101	FM 9-207 TM 9-2350-217-10N FM 31-79 FM 31-79 TEC Lesson 945-77-0101	٧	«	∢	⋖				О	₹	<	MIN		:			System	:		!
LASK SELETION, CODE, LASK MODIFICATION CODE	Madoffication CO No Change in Task Minor task modifications in squipment/forms in squipment/forms still level frequenty due to Major task modification importance change	retially the same. Only ed ty the same but assigned in tasts, is performed in phility, etc., chancieristics (e.g., diff	he same. Only ime but assigns is performed in e.	me. Only ut essique lormed rr (o q . diff	A La La Sala	► ± ⊊ ±	metros i to di un (lei sulty.	chang Afterer 16.)	3			# > 8 % 4 % 4 % =	FREOUGNCY CODE 7 Mone than neve 6 Daily 5 Weekly 4 Monthly 3 There is Set in 2 Once or refer 1 Lest than once	More than once a day More than once a day Morely Monthly There to Six tones a year Once on twice a year Lext than once a year						

Table C2 1. EXISTING TASK DELETION/MODIFICATION WORKSHEET (Lantinued)

REI TASK CHAN SHEET					
# 5 5 8					
ADDITIONAL MEDIA		1041,061 6024	Equitibrator Elebrating & Traversing Mechanism 1041 061 6132J Prefre Checks (M109)	R21041 061 6170E Boresphing the M109 M109A1	
DESIGN CHANGE NO			,		
SUBSYSTEM			Equilibrator System	System	
NEW					
EXIST					
NEW SKILL LEVEL			1 1		OF over a day
TASK DELETION CODE					FREQUENCY CODE 7 Motes than once a day 8 Dativ 5 Weekly 4 Monthly 3 There to Sie times a year 2 Once ou torce a year 1 Less than once a year
TASK MOD CODE			Z Z	Mil	# W & B & B & B W =
L FM6 136/CM	TRAINING RESPONSIBILITY INSTITUTION UNIT	Scheduled Training Self Study SOJT Service School SGMA ANCOC BNCOC PNCOC AIT/OS'JT BCT	< <	<	d the translativ the same Only minor change required to different task but assigned to different task but task is performed more lies).
IANUAL	INITIAL	TRAINING	m m	е .	sorrially tred ally the but task tubility.
COMMANDER'S MANUAL		PRIMARY TRAINING Meiriel	TM \$2350.217.10N TM \$2350.217.10N TEC Leson Odl 061.6132.J	FM 6-286-217-10N	MODIFICATION CODE. No Change in Tash Require Menor tash andditication to in equipment/formendative Staff used change tash half level frequency change state frequency change f
138		TASK DESCRIPTION	Adjust the Equilibrator on the M109/M109A1 Perform Parise Chacks on the M109/M109A1	Verity Boresight Performed on the M109/ M109A I Using a Distant Alming Point (DAP	system f mer Puber
WOS 13B		TASK NUMBER	061 270 3429 (3.48) (661 270 3430 (3.49)	061 270 3307	(Comtinued) [ASK XLETION CODE. E11 Elemention of Solid AUT Task Automation MISS Increase in Middle O Others (7) Conceptual Addition

Table C2 1. EXISTING TASK DELETION/ANDIFICATION WORKSHEET (Conschilded)

REL TASK CHAR SHEET			138 я 2	8	2 3	18. 18. 19.	
ADDITIONAL MFDIA		901.06	Jest of Gamp 1 Outlester (My 1 Outlester (My 1 Outlester (My 2 Outlester (My 2 Outlester (My 2 Outlester (My 3 Outlest	fing Direct Fire Sca 1 6029 J Mounted			
DF SIGN CHANGE NO					1	1	
SURSYSTEM			fire Control	Remmer	Operating CAM	System	
THE D							
EXIST FREO					,		į
NEW SKII L LEVEI				1			DF nure a day to a vest
rask DE1F1109 CODE				:	; ! '	,	FREQUENCY CODE More than once a day B Delty Westly Monthly Monthly J Hurse to Statums a year C Dice or twice a year Less than once a year
TASK MOD. CODE			AEL	MAJ	2	MAJ	7 2 3 4 5 4 4 7 FC
JAL FM6 138/CM	TRAINING RESPONSIBILITY INSTITUTION UNIT	Scheduled Training Self Study SOUT Service School SGMA ANCOC BNCOC PNCOC AIT/OSUT BCT	<	V V 00	V V O	< C	Regulard Regulard stem tests essentially the same Only minor change test exemitally the same had assigned to different same task but test is performed more fless) change in reliability, set. Assign tests characteristics (e.g., difficulty,
COMMANDER'S MANUAL	LEVEL	PRIMARY TRAINING Missish	FM 688 TM 9.256.217.10N FEC Lesson 041.061.8102.F IEC Lesson 1.061.8102.F IEC Lesson 1.061.8102.F IEC Lesson 1.061.8102.F IEC Lesson 041.061.812.F IEC Lesson 041.061.812.F IEC Lesson 041.061.812.F IEC Lesson 041.061.812.F		TM 9 2350 217 10N	1M 9 2360 217 10N	ILASK MEXISTEGATION CODE. NO. No Change in lask flequined MIN. Menor test modification task essentially the same Only minor change in equipment/homanicature required SKI Skil fend change task essentially the same hot assigned to different skill fend. REL Frequency change same task but task to performed more fless) the frequency change same task but task to performed more fless) MAJ Melor lask modification insportance change (C) - Conceptual Modification
87		TASK DESCRIPTION	Perform Fire Control Alterment Tests on the MT08/MT09A I	 	8	Perform the Westry/ Manthy Lubrication on the MIOS/MIOSA1	ystem res Policy
MOS		TASK NUMBER	(3 40)	061 270 3436 (3 54)	(3.55)	051 270 3425 (3-56)	IASK SEETION CODE. E11 Elimenation of Salth A11 Test Automation M186 Increase in Ministers Openies in Mainters O Other (C) - Conceptual Addition

the transfer of the second

13th C22. EXISTING TASK DELETION/MODIFICATION WOHKSHEET

REL JASK CHAR SHEET								i							
APDITIONAL T					2101.113.7146.A. (146) Test Operate AN/VRC 12	3101 113 7147 A (046) Sys. Enubleshoot Redio in a Wheeled Vehicle	2101 113 7144 A (046) Install AN/VRC 17	2101 113 7145 A [046] Test Operate AN/VRC-12	2101 113.7146 A (046) Perform Organizational QTRLY PM						
DESIGN CHANGE NO					1										
SUBSYSTEM					AN/VRC 12	AN/VRC 12	AN/VRC 12	ANVRC 12	ANVRC 12						
NEW FREQ								į							
EXIST														į	
NEW SKILL LEVEL					·* · · <u>-</u>		,			ž.	ner a day			times a y	1 Ac 10 Ac 1
1ASK DELETION CODE					i	1	1			FRECHIENCY CODE	Mure than once a day	Dady	Mennelbly	Three to Six times a year	Less than once a year
TASK MOD. CODE					J.	NC NC	S S	S Z	NC	FREC	-	• •		n /	
FMTI31V/CM	TRAINING RESPONSIBILITY	INSTITUTION UNIT	TCC SCD TNG Solf-Study SOJT USA SMA SPT SCH ANCOC PLC BT/AIT OSUT		4	<	<	<	G.		Minor tests modification tests espentially the same Only revinor change		the same but assigned to different	task is performed more ffets) ity, etc	task characteristics (8 g. difficulty.
MANUA	IN	TIAL /EL	TRAINING		-	-	-	-	-		essentially	Perud		t but tenferbalty.	sk charact
COMMANDER'S MANUAL			PRIMARY TRAINING Materials		TM 11-5820-401-12 TM 11-6625-496-12 Fest 113-623-3022	TM 11 5870-401-12 Leik 113-587-3026 Teik 113-623-3022	TM 11:5820-401:12 Tesk 113:623:3022	TM 11 5820 401 12 Tmt 113 623 3022	TM 11:5620 401 12 DA PAM 316.7 Tesk 113 623 3022	LASK MODIFICATION CODE	•		Skill lavel change task essentially skill level	L. Frequency change same task but task is frequently due to change in retability, etc.	Major test modification importance change Conceptual Modification
VIE			TASK DESCRIPTION		Operate Radio Test Sat AN/VRM 11°) to Test Modules in AN/VRC-12 Series Radio Sets	Systems Troukeshoot Radio Set ANVIRC 12 Including Control Frequency Selector CATZ/VRC to a Defective Component, Cable, or Accessory	Verify Installation of Radio Set AN/VRC 12 in a Tracked Vehicle	Evaluate the Operation of Radio Set AN/VRC-12	Perform Disparizational TM 11:5820-401 12 Quarterly Presenter Mants DA PAM 316.7 naure on Radin Set ANVPRC Test 113:823 3022 12	1			Change in Maintenance Publicy SKI	Addition	
MOS 31V			TASY. NUMBER		113-574-2058	113 S87 N032	113 587 1019	820C 285 C11	113 587 3029 frontinued)	LASK PELETION COOF			. '	(C) - Core-spheric Additions	

Tabe C2.2. EXISTING TASK DELETION/ANDDIFICATION WORKSHEET (concluded)

SOM	VIE	COMMANDER'S MANUAL	ANUAL	,	VM11-31V/CM	//CM				TASK MOD. CODE	TASK DE1ETIOS CODE	NEW SKILL LEVEL	FREC	NEW FREO.	SUMSYSTEM	DE SIGN CNANGE NO	ADDITIONAL MEDIA	REL. TASK CHAR. SHEET
			INITI		AININ	G RESP	TRAINING RESPONSIBILITY	2										
			AL L	ž.	INSTITUTION	ž	-	CNIT	Ī									
		PRIMARY TRAINING	TRAINING			BT/AIT OSUT	Self-Study	SCD TN	TCC									
TASK NUMBER	TASK DESCRIPTION	Materials			٦			S .										
113 567 7029	Check Performance of Operator's Preventive Maintenance on ANVRC-12 12 Series Radio Sets	Test 113 623 3022 TM 36 750 SSO 712 TM 11 6829 401 12	2			0	≺		4	S S	i,	ı	t		AN/VRC 12	-	2101-113-7146.A (046) Perform Organizational QTRLY PM	
113 587 7040	Check Performance of Organizational Preventive Maintenance on ANVRC-12 Serier Radio Sets	TM 11-6620-401.12 TM 38-750 SSO 712 SSO 734 SSO 734 Test 113-587-3029 Test 113-587-3022	~			0	<		∢	Š	1	ı	i		AN/VRC 12	-	2101 113 7146.A (46) Perform Organizational OTRLY PM	
LASK JELETION CODE.		TASK MODIFICATION CODE								Ē	FREQUENCY CODE	300						
E11 Elimination of Subt ANT Test Automation MTBF - Increase in MTBI ME Change in Melatrina O Other (C) - Conceptud Addition	Elimination of Subsystem NC - Test Austonation MAN Test Austonation MAN Charge in Melestrance Policy 8K1 Nets Conceptual Addition MAA	No Change in Tash Requires Manot stab modification to in equipment/foomendation Shift level change tests on shift level change tests on frequently due to change it frequently due to change it Major sets modification importered change	is comingly the same Only related to copied as comingly the same but aniigned to task but task but task is performed more the nelitability, etc. 1984 characteristics (e.g., difficulty,	the sam same but is perfo rittics fe	onty	minner c nd to diff rore (hrs	hange Jerent			~*******	More than Dally Workly Monthly Three to St	Mote than once a day Daily Weekly Monthly Altree to Sax times a year Chice or twice a year Less than once a year	24					
	(C)	(C) - Conceptual Mindiffication																

Table C2 3 EXISTING TASK DELETINGANDIFICATION WORKSHEET

	TIALL
	TEC/CORF FOJT PLC/FTT AIT BCT TRAINING
PRIMARY THAINING	
TM 9-1240-324-36	
TM 9.1240.324.36 1	1 REL 4 3 Infinity Collimator
TM 750-116	1 Infinity Cultimator
TM 9 6015	R Akrang Pust
IM 9 1290 322 36 1	H HEL 4 3 MIS Fre Cantrol
0 322 36	
MAS MADIFICATION CODE. No. No Change in fash Brequend MMN Menos tash modification tash steminally the same Unity nature change in squapment/homendature required Still Sold local change tash resembled the same but anyging to different shall local Major the following tame tash but tash is performed more flost Major tash modification tash but tash is performed more flost importance tash modification tash but tash is performed more flost importance tash modification tash but accretises for difficulty importance change.	the translative the same Unity nature change B Mare than outer a day required B Dealy tentrally the same four anymed to different B Weakly test task is performed unare (less) 3 Three to Sen times a year to the deal of the same (less) 3 Three to Sen times a year task characteristics (e.g., difficulty,

Tube C2-3. EXISTING TASK DELETION/ANDIFICATION WORKSHEET (voincluded)

				:		;			_			-		-					
MUS 416	210	CUMMANDEH'S MANUAL	ANUAL	•						TASK MOD: CUDE	TASK DELETION COUE	NEW SKILL LEVEL	EXIST FREG	NEW FREG	\$U#\$V\$1£#	DE SIGN CHANGE NO	ADDITIONAL MEDIA	HEL. TASK CHAR. SHEET.	
			INI'	=	HAMIN	S HES	THAMING HESPONSIBILITY	È											
			TIAL VEL	1948	MSTITUTION	3	_	UNI	1										
			TRAINING	AIT	PLC/PTT			FOJT											
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Materials						RR						_					
ر ا	Trioubleshoot Punoramic Tribucupa M115	TM 9 1240-292 34	•	-						HEL			•	m	M116 Panoramic Telescope			41C.C.1	
WEI 41C 1581	Overgo Passocianos Tale- scupa Mills With Watergan	IM 9 1240 292 50	-	-			_	Ξ		REL			•	er	M116 Panoramic Talescope			41C.C:1	
081 41C 1582	Nephra Cracked Less in Eygpers of Pathiamic Telescope M115	TM 9 1240 292.34 TM 9 1240.292.50						æ		REL			•	m	M115 Panoramic Telescope			410.01	
: I	Imaall Talencupe Mount M145 n. SP Hounton M109	TM 9.2360.217.20	-	-				α		REI.			•	~	Telescope Mount			410 0.1	
091 41C 1601	Synchronice Telescope Mauni M146 in SP Houseave M108	TM 9236021720	-	-				Œ		REL			•	m	Telescope Mount		1	41C.C.1	
091 41C 3580	Impection	TM B-1240 282 34		-		!		Œ		SK KC					Partoramic Telescope				-
09) 41C 3581	Supervise Synchroniting of M145 Telescope Mount in M148 Saff Propried Head	186 18 2350 217 20	6	-				æ		NC.					Pavoramic Telescupe				
1965 ALETHW CODE		TASK MIDITICATION CODE.								FREC	FREGUENCY CODE	Ď.							
	My sterrin	*								~	More then once a day	nice a day							
AUT Took Autometion	Intration May	Menor tash muditheation tash assentially the same Only nation change in equipment/nonenclature required.	ired ired	<u> </u>	ě O	nutro.	chenge			•	Dady								
Me Change in	Ohanga in Maintenance Pulicy SKI			the same but assigned to different	4	5 2 9	Heren			~ ~	Workly Munthly								
O Uther IC) - Conseptud Addition	Addition	:	but tash Refelty.	ate, part	- pauli	est (le	7			e	Three to Six timus a	Three to Sen tenus a year	3						
	KA		tash characteristics fe.g., difficulty,	restics (4	Headly.					Len than once a year	100 a year							
	3	(C) - Conceptual Modelication																	

Table C2.4. Existing Task Deletion/Modification Worksheet

]
REL. TASK CHAR. SHEET.									
ADDITIONAL MEDIA						1643 091 G708 F (118) Meaning and Evaluating Gron Tube Wear			
DESIGN CHANGE NO.					,				
SURSYSTEM					Brech Mechanism	Carmon Tube	Cannon Tube	Replenishas	
NEW FREG									
EXIST.									***
NFW SKILL SKILL									NEEMCY CODE Motor than coice a day Daily Weekly Monthly Fluer in Six tomes a year Coice on twice a year Less than coice a year
rask ueletion code									
TASK MOD. CODE					MIN	N N N N N N N N N N N N N N N N N N N	2 3	N	F
COMMANDER'S MANUAL FMR-45K/CM	THE TRAINING RESPONSIBILITY	INSTITUTION UNIT	TEC/CORR FOJT PLC/PTT AIT BCT TRAINING		OS 451,207, Medium Self 3 Propalled Arbitory Maintenance TM 9.2360-217.20	OS 461202, Fundamentals 3 Of Actificity Systems and Components 1 TM 9 1000 202 36 TM 9 2360 217 34/2 TM 9 4913 200 36 TM 39 150	Os 461.207, Medium Self 3 Propelled Autiliary Maintenance TM 9.2500.217.3472	OS 451 207, Meritum Sell 3 Propolled Autiflety Maintenance TM 9 2360 217 34/2	MODIFICATION CODE. No Change in Task Required Makers task anomalitation state seasitably the same. Only rather change in quiperentificamentalisture required. Sail herd change same task statistical treasme but assumed to different tenderscy change same task host task level. Frequency change same task host task is performed more fired tengenety change in reliability, etc., Handerstein modification task characteristics (e.g. difficulty, importance) change.
			PRIMARY TASK DESCRIPTION Merida	Perform Inspection and Suparies Support Maintenance of Hernites, Medium, Sell Propalled, 1556481, N109A.1:	Remove and Install OS 451,207, Media Components of Breech Propelited Artiflety Mechanism TM 9-2350-217-20	kerkcahility of 10 lbing a	reise Removal and Bation of Carston Tube at Change)	er arine emble mbby	TASK J
MUS GEK			TASK NUMMER	Perform Inspects Maintenaure of Self Propolled	è	5K 376A	-	091 45K 3770 US	LASK KEETON CODE Et 1 Enmission of Subsystem AUT Test Automation MIBE Increase in Manienance Pro O Other (C) - Conceptual Addition

Table C2-4. EXISTING TASK UFLETION/MODIFICATION WORKSHEET (continued)

MOS 48K	48 K	COMMANDER'S MANUAL	IANUA		FM8-45K/CM	C/CM	i			TASK MOD. CODE	TASK DELETION E CODE	ובאנו אנוור אנא	F MEO.	NEW FREO	SURSYSTEM	DESIGN CHANGE NO	ADDITIONAL MEDIA	HEL. TASK CHAR. SHEET
			INIT		TRA	MING	TRAINING RESPONSIBILITY	in a second										
			IAL EL	=	INSTITUTION	MOIL		-	T NO									
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Maverids	TRAINING	BCT	PLC/PTT			FOJT	YEC/CORR									
091-45K 3771	Disassemble, Daternaine Ropair, and Assemble Rammer Assembly	OS 451.207, Medium Solf. Popelled Artiflery Malerenance: TM 9.2560.217.34/2	6					Œ	Œ	ž	Z				Ramerner			
081 65K 3772	Troublesions and Isolate Mailurestioning Components of Cab Electrical System	GE 451.207, Medlem Self. Propelled Artiflery Mariereners; TM 9.2360.217-20	6					#	Œ	REL	2 -		٠	uo.	Ceb Electrical	NO8-4	1642-091 5801-J (080) Tribith Gun Travera & Elevat Control Circuit	
99) 65K 3773	Supervise Remoral and Installation of Hydraulic Powerpack	Os 451,207, Methem Self. Propalted Artiflery Mehremance; TM 9-2360-217-34/2	е					æ	-	MIN	2				Hydrautic Power pack			
091 45K.3774	Dissertable, Determine Repair, and Assemble Elevating Equilibrator Assembly	OS 451.207, Machum Self. Popelle J Artiflery Melntreance: TM 9-256-217-34/2	m	-				Œ	Œ	New	2				Equilibrator			
081-45K 3775	Supervise Removal. Dissecubly, Assembly, and fresultation of Traversing Nechanism	OS 451.207, Medham Self- Propelled Artiflery Maintenspec: TM 9.2360.217.34/2	e					<u>«</u>	_	Z Z	Z				Traversing Riectanism			
LASK XELETION CODE.		*									FREQUENCY CODE	CODE						
EL! Filmingdir	eystem.	•									7 More than	More than once a day	.					
AUT Took Au	Task Automation MIN	M Million task modification task essentially the same Only minor change in equipment/normaliclature required	gentlally rived	į	Į	E A	and cha	ŧ			• Delly							
Ne Charte In	Change in Maintenance Policy SKI		iaffy the	Ě	ī	1	the same but srigned to different	E		•	6 Weekly 4 Monthly							
0 000	AEL		1	2	#for#	d more	(Jess)			•	J Three to	Three to Six times a year	year					
ICJ - Conceptual American	- Antithon		Paramety.	teriotics.		ly, enc. sacteristics in a difficulty	ž				2 Once or	Once or twice a year						

		1		í
		1		
-	•	-	_	

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Frequency change same task but task is performed more fless) frequently due to change in reliability, etc.

Major task modification task characteristics (a.g., difficulty, importance) change

Inequantity due to cheen MA3 Major tash mudification importened change (C) - Conceptual Mindfiltation

Toble C2.4. EXISTING FASK DELETION//MODIFICATION WORKSHEET (concluded)

WOW	高天	COMMANDER'S MANUAL	AANUAL	•	FARB 45K/CM	COM		 	TASK MOD. CODE	TASK DELETIKN	NEW BRULL	EXIST.	NEW FREG.	SUBSYSTEM	DESIGN CHANGE NO.	ADSI TIQNAL MF DIA	REL. 1ASK CHAR. SHFET.
			INITIAL LEVEL	188	TRAINING	A RES	TRAINING RESPONSIBILITY	17. UNI									
TASK NIMBER	TASK DESCRIPTION	PRIMARY TRAINING Maintigh	<u></u>	AIT	PLC/PTT		root	TEC/CORR	 	<u> </u>							
091 45K 3776	Impact and Determine Sequence for Repair of Hydraulic Powerpach, Genner's Control, and Crb Hydraulic System	OS 461207, Medium Suft. Propulled Artiflery Meintenence: TM 9.2360.217.34/2	m				Œ	Œ	§					Hydraulic			
LASK JELETION CODE.	24.183	TASK MODIFICATION CODE,]	1	1	1	1			FREQUENCY CODE	300:						
•	nes Prinkey	Minor test modification to in regisponen/homerochtuse Staff bend change test to thill bend frequently change same frequently due to change frequently due to change minoriance) change Conceptual Mondification	tressentially the same Only minor required to exemple the same but assigned to examine the same but assigned more fit in reliability, etc. the characteristics to g. difficulty, then characteristics to g. difficulty.	the same arms but to perfor	Dody assignment in a definite	arther el d'10 déti ore (fessi culty.	and the same of th			More than Daily Moretty Morett	More than once a day Daily Workly Monthly There to Six times a year Once on twice a year Less than once a year	**					

Table C2 6. EXISTING TASK DELETION/MODIFICATION WOHKSHEET

NON .	199	COMMANDER'S MANUAL	ANUAL		K2778F 687/CW	NC)			- 20	MOD. C	TASK DELETION CODE	NEW SKILL LEVEL	EXIST.	NEW FREO.	SURGYSTEM	DESIGN CHANGE NO.	ADDITIONAL MEDIA	REL. TASK CHAR. SHFET
			INITIA	I SE	TRAINING	G REST	TRAINING RESPONSIBILITY STITUTION	<u> </u>										
TASK MARBER	TASK DESCHIPTION	PRIMARY TRAINING Marrish	TRAINING	AIT	PLC/PTT		FOJT											
HOWITZER, MED 1554M, MIGBA1	HOWITZER, MEDIUM, SELF PROPELLED.																	
Cannon Assembly	1								==									
001 45L 1561	Remove and install Components of Breech Machanism	OS 451.207, Medium Self. Propelled Artitlery Maintenance; TM 9.2560.217.20	-				-	æ	_	2	,	,	ı	1	Breech Mechanism	i		
001 451 2552	Impret Camon Tube Iting M2 Borescope	OS 461.202, Fundamentals of Artitlery Systems and Components: TM 9 1000.202.36, TM 9230.202.37, TM 9433.200.36,	~		-			Œ		ž.	,	ı	ı	i	Cannon Tube	ı	1643.091 6707 F (118) Centon Bote and Poundr: Chamber Eval	
(Continued)	Dujoraniu Servicesbility of General Tabe Heing Pullmer Gage		~		-		C	•	_	ž.		ı	1	1	Cannon Tube	1	1643 091 6708F (118) Messuring and tube evaluating gan tube	
LASS JELETION CODE Ett Etmucation of Sale Att Test Automation Mille Increase in Mills NP Change in Memoring O Other (C) - Conceptual Addition	nee Politey	IASK MODIFICATION CODE. No. No Change in Task Required. Min Memor sak modification task eventisky the same Only minor change in equipment/momentature required. Skil Skill level change task resemisky the same but aniqued to different skill level. REL Frequency change same task but task is performed more (test) temperately due to change in reliability, etc MAJ Mejer test modification task characteristics (e.g. difficulty, importance) change.	to eventially the same Only minns remisely the same but animed to use but test is performed more () is reliablely, etc	the same build is parting #E.	Only anishment in the control of the	y the same Only minor change same but exigend to different is in performed more (test) etc	# W # # # # # # # # # # # # # # # # # #	1		#	FREQUENCY CODE More than once a day Daily Monthly Monthly There to Statimes a year Cone or twice a year Less than once a year	nce a day limes a ye e a year	•					

Table C2.5. EXISTING TASK DELETION/MODIFICATION WORKSHEET (nontinued)

MOS	199	COMMANDER'S MANUAL	ANUAL	'	FM8 451/CM	/CM		,		TASK MOD. CODE	TASK DELETION CODE	NEW SKILL LEVEL	EXIST	NEW	SUBSYSTEM	DESIGN CHANGE NO.	ADDITIONAL IMEDIA	HEL. TASK CHAR. SHEET.
			INITIAL	Z	TRAINING	NG RE	TRAINING RESPONSIBILITY	213	UMIT									
TASK MIMBER	TASK DESCRIPTION	FRIMARY TRAINING Merorick	TRAINING	AIT BCT	PLC/PTT			FOJT	TEC/CORR	 								
∤ %:	Install Carnon Change	OS 651.207, Madium Solf. Propelled Artillery Maintenance TM 9.256.217.3472	~		-			œ	Œ	ž Š	;	ı	1		Cannon Tube	,		
991 121 2542	Remore and Install Connon Assembly	OS 451.207 Medium Self Propulsed Artiflery Maintenance TM 9.2350.217.30 TM 9.2350.217.34/2	~		-			<u> </u>	Œ	ž		1	1		Cannon Assembly	,		
RECOIL MECHANISM	757			L	-				_									
AP1 451 1558	Disassemble and Assemble Counterscoil Buller Assembly	OS 46L207, Meritum Self. Propelled Artiflery Naintenance TM 9.2350.217.34/2	-	-				<u> </u>	a	ž	ı	ı	1		Buller Arsembly			
	Disassenthe, Repair, and Assemble Replenisher Assembly	OS 451.207 Medium Self- Propelled Artiflery Meintenance TM 9.2350.217.34/2	~	=				Œ	-	ž	ľ	,	,		Repair Recuperator Assembly	1		
15 N	A Agranda	OS #51.207 Medium Self- Pmpelled Artiflery Meintenance; TM 9.2360.217.34/2 TM 38.750	~		-			Œ		3	,	ı	1		Repair Recuperator Assembly			
181 481 255A	Disseventhe Assemble, Inspect, and Repair Vasiable Recoil Group and Recoil Cylinder Assembly Constituted	08 45L207, Medium Salt— Propiled Atliffery Maintenance; TM 9.2560 217 34/2 TM 30 750	~		-			æ		N.	1	-	·		Recoil Cylinder			
LASK JELETION CODE.		LASK MORTICATION CODE.								Ē	FREQUENCY CODE	ğ						
	Elemenature of Subsystem NC	•								,	More then once a dev	ance a day						
AIR Test Ass	Task Automotion MIN	4 Militar Lask modification task essentially in equipment/monenclature required	_	į	ě	the same Only minor change	change			•	Outh							
	Change in Maintenance Policy SKI		ŧ	Ŧ	pass r	some has essigned to different	Kiferent			£ 4	Month							
0	3	REL - Frequency change same task but task is performed more (less)	Put tesk	1	Damie	more (k	.			c	Three to St	Three to Six tieres a year	į					

REL - Enquency change unne test but task is proformed more fless brequently due to change in reliability, etc.

MAJ Major and modification test characteristics (e.g. difficulty, importance) change.

(C) - Conceptual Montification

3 Three to Six times a year 2 Chica or twice a year 1 Less than once a year

SOM	194	COMMANDER'S MANUAL	IANUAL		FM 9-45 L/CM	T/CM		.		TASK MOD: CODE	TASK DELETION CODE	NEW SKILL LEVEL	EXIST.	NEW FREG.	SUBSYSTEM	DESIGN CHANGE NO.	ADOITIONAL MEDIA	HEL TASK CHAR SHEET
			INITIA	Š	TRAINING	TRAINING RESPONSIBILITY	PONSIBI	LITY	Π.									
			L TRAIM	A:T BCT	PLC/			FOJT										
TASK NUMMER	TASK DESCRIPTION	PRIMARY TRAINING Meterick	NG		PTT			CORR										
091 451 1560	Drassemble, Repeir, and Assemble Rammer Assembly	OS 45L297, Medium Self Propelled Artillery Maintenance; TM 9-2360 217-34/2	-	-				Œ		Ž.	ı	1	ı	1	Rammer Assembly	i		
1991 1991 160	tusters and Repair Cab Electrical System by Tracing Circuits on Electrical Dargams and Using a Maltimeter to Meanier Voltage and Resistance	Vorlate and Repair Cab OS 451.207, Medium Salt— Electrical System by Tracing Propalled Artiflery Maintenance; Circuits on Electrical TM 9.2360.217.20 Deaparm and Using a Maintenance to Measure Voltage and Resistance	-	-				- œ		MIN. REL(C)	1 1	1.1	1 10	l us	Cab Electrical	N06 4		
091 451 1562	Remove and Install Hydraulic Powerpach	05 461207, Madium Self Propelled Artiflery Maintenance; TM 9-2360-217-34/2	-	-				er er		Z Z		1,	1		Hydraulic Powerpack			
001 451 156.1	Remove and Install Ganner's OS 461.207. Medium Towed Centrol Assillery Maistenance: IM 9.2360.217.34/2	OS 45L207, Medium Towed Artiflery Maintenance; TM 9.2350.217.34/2	-	-				æ		NIN			,	,	Gunner's Comtrol			
991 451 2544	Drassemble, Repair, and Avermble Elevating Equilibrator Assembly	OS 461.207, Medium Sall— Propelied Attillery Maintenance; TM 9.2360.217.34/2 TM 38.750	~		_			E		ž.	1	,			Equilibrator Assembly			
D91 451 2565 Creetinged		OS 461.207, Medium Self. Propelled Artiflery Maintenance. TM 9 2360.217 34/2, TM 38 750	~		_			E		Ä.	,	i,			Cato Race			<u> </u>
LASK XLETION CODE		LASK MODIFICATION CODE			}					FAEO	FREQUENCY CODE	- *						

EL! Elimunation of Subsystem	INC. No Change in Task Required
AIN Last Automation	MIN Minor task modification task eventially the serve Only minor change
MIBE becream to MIBE	in equipment/nomenclature required
MF Change in Mantenance Policy	SK1 Shift level change task promitally the same but assigned to different
- C	Links Hay
(C) - Cantryphus Addition	HEL Frequency change some task but task to performed more (Ins) frequently due to change in reliability, etc.
	MAIN MAN AND M

MAJ Major task medification task characteristics (e.g., difficulty, importance) change
(C) - Conceptual Mndification

FREQUENCY CODE

7 More than once a day
6 Daily
6 Weekly
6 Monthly
3 Three to Six times a year
2 Once or twice a year
1 Less than once a year

C-42

Table C2.5. EXISTING TASK DELETION/MODIFICATION WORKSHEET (curchddd)

SOM	150	COMMANDER'S MANUAL	IANUAL	ı	FM 9-45L/CM	SL/CM		ı		1 ASK	TASK	NEW		3			DESIGN		12 3
			:		,					MOD	CODE	TEVEL SKILL				SUBSYSTEM	CHANGE	ADDITIONAL MEDIA	CHAR
			INI		FAINI	NG PRE	TRAINING RESPONSIBILITY	MLITY											
			TIAL VEL	ž	NSTITUTION	₹0		UNIT	=				-						
			TRAINING	BCT	PLC/PT			FOJT	TEC/C				·						
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Materials	3		7				000										<u>-, -</u>
091 45L 2566	Remose, Repair, and Install Traversing Mechanism	OS 451.207, Medium Self - Propelled Artillery Maintenance: TM 8-2360-217 34/2 TM 38-790	2		-			Œ				,	÷		Traversing Mechanism	eing mism		1642 091 5801J (080) Troubleshooting Gun Traverse and Elevat.	
081 CE L 2567	Repair Hydraulic Powerpack, Gunner's Control, and Cab Hydraulic System	OS 451.207, Medium Self— Propelled Artiflery Maintenence; TM 92.350.217.34/2 TM 38.750	2		_			er er		Min	i	,	,		Hydra	Hydraulic System			ļ ·
																			ļ
																			
LASK JELETIUM CODE.	netten	LASK MODIFICATION CODE. NC No Change in Task Required								FRE /	FREQUENCY CODE	nDE							

and the same of th

¥\$¥	LASK JELETION CODE	LASK	LASK MODIFICATION CODE
11	ELI Elimination of Subsystein	Š	NC No Change in Task Required
Ī	ALI Task Automation	ž	MRN Minor task modification task essentially the same Only minor cha
MTBI	MTBI Increase in MIRE		in equipment/nomenclature required
Ì	MR Change in Maintenance Policy	SK	Skiff level change task essentially the same but assigned to Olife
O Other	Debar	118	Fermance change same task but task is necformed note (less)
Ç	(C) - Conceptual Addition		frequently due to change in reliability, etc.
		¥¥	Major task modification task characteristics fra difficulty.

THE COLUMN TANDE	More than once a day	Dailty	Westly	Marithy	Three to Six times a year	Once nt twine a year	Less than once a year	
	^	•	s n	•	E	2	-	
		a fire	1001					

Table C2 6. EXISTING TASK DELETION/ARIBIFICATION WORKSHEET

MOS		COMMANDER'S MANUAL	IANUAL		FM9-63C/CM		ı	TASK MADD. CODE	TASK DELETION CODE	NEW SKILL LEVEL	EXIST FRFQ	NEW FREG	SUBSYSTEM	DESIGN CHANGE NO	ADDITIONAL MEDIA	RFL TASK CHAR SHEET
			INI	=	BAINING	TRAINING RESPONSIBILITY	ICITY		-							
			TIAL /EL	INS.	INSTITUTION	_	I.N.									
			TRAINING	AIT	FOJT PLC/PTT		TEC/COR	T								
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Materials					P									
Technical Tasks					-			<u> </u>								
Waintenance of Fracked	Fracked			_				_								
001.63C 1665	Bonness of Miles	5						==								
	Howitzer Powerplant	02 /12 002 2 6 m1		_	_		_	MIN REL(C)	, ,	1	1 4	. 6	Powerplant	N01:2		,
091 63C 1692	Service Engine Fuel Filters or M809 Howitzer	TM 9.2350.217.20	-	=	=			Z			:		Fuel Filter			
091 63C 1693	Remove and Replace a Fuel Suprily Pump on an	TM 9.2350.217.20	-	=	7			X	1	1			Fuel Pump			
091 635, 1694	Perform a Fuel Flow Tess on an 8V/17 Engine Fuel Fump in an M109 Howitzer	TM 9 2350 217 20	-		-			Z	;				Fuel Pump			
ON1 63C 1712	Remove and Replace Contant Radiator on an M109A1 Howitzer Engine	TM 9 2350 217 10,	-		-			MIN REL(C)	-		: -		Radiator	NO5 1 NO5 2		63C.C.1
160 6 tr. 1696	Remove and Replace Air Chances on an M109A1 Howetzer	TM 9 2350 217 20	-	-	æ			MIN RELIC)			us.		Air Cleaners	N031		F3C.C.1
LASK JELETION CODE		LASK MODIFICATION CODE		7	1			7	4							
	nystem	No Change in Task Required						Ξ.	FREGUENCY CORE	300						
Allf Task Automation MIBF Increase in MTB			sentially .	The same	Only H	ince change		. 10	Daily	Monte than once a day Daily						
. '	Change in Maintenance Publicy SKF	f Shiff level change task essentially the same but assigned to idillerent shift level	elly the s	erre bris	panduce	to different		.	Workly							
(C) - Contempted Addition	Addition	 Frequency change tame task but task is performed more (less) frequently due to change in reliability, etc. 	but task ability, e	is perfe	and mor	· text		е.	There to S	There to Six terms & vigit	1844					
	MA	_ '	characte	mites 6	task characteristics to q. difficulty	Ì		-	les than	Less than once a year						
	9	Conceptual Modelscatton														

Table C2.6. EXISTING TASK DELETION/MODIFICATION WORKSHEET (continued)

MOS		COMMANDER'S MANUAL	MANUA	٦	FM8 63C/CM	сусм		TASK MOD CUDE	TASK DELETION CODE	NEW SKILL LEVEL	EXIST FREU	NEW FREO	SUBSYSTEM	DESIGN CHANGE NO	ADDITIONAL MEDIA	REL. TASK CHAR SHEFT
			IN!		TRAIN	TRAINING RESPONSIBILITY	SIBILITY									
			TIAL /EL	₹	INSTITUTION	NOI	UNIT	Ī								
			TRAININ	BCT	FOJT PLC/PTT		TEC/COF									
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Materials	G			·	RR	_==								
091 63C 1729	Remine and Replace States on an 8V711 Engine	TM 9.2300.216.20. TM 9.2350.217.20 TM 9.2350.238.20	-	_	<u>«</u>			MIN REL(C)			. 4	Б	Engine Starter	1 90N		63C.C.1
Maintenance of Irm Suspension Systems	Maintenance of Tricked Vehicle Track and Suppension Systems															: <u>.</u>
091 63C 1771	Troubleshnot Suspension System on a Tracked Vehicle	Applicable vehicle TM, TM 38 750	-	-	<u> </u>			NC REL(C)	:	: 1	: 40	ro S	Suspension System	E 13 1		
091 63C 1772	Inspect a Tracked Vehicle Suspension System	Applicable vehicle TM, TM 38.750	-	-	<u>ec</u>			N.C								!
091 63C 1773	Repair Tracked Vehicle Suspension System	Applicable vehicle TM	-	-	œ			NC REL(C)		, ,	1 40	5	Suspension System	N13.1		
091 630: 1775	Remove and Replace a Torsion Sar on an M109A1 Howitzer	TM 9.2350.217 10, TM 9.2350.217.20	-	-	Ε			N. S.		·		_	Torston Bar			!
091 6TC 1776	Replace M M	 - 	l -	-	<u> </u>	1		Z Z	i	:			Drive Sprockets			
091 63C 1778	Adjust Track	TM 9 2320 222 10	-	-	65			ž					Track			
U91 63C 1779	Remove Track	TM 9-2320-222-10	-	- i	#			=				-	Irack	- 		
(continued)	Install fract	FM 9 2320 222 10					_	NC				-	rack			
LASK JELETION CODE		LASK MODIFICATION CODE						78.	FREQUENCY CODE	ĎĒ						

Florination of Subsystem

Task Automation 36 Incress in MTBF Change in Manitenance Pubcy E11 Elemination of Subsysta AUT Task Automation MTBF Increase in MTBF MP Change in Ministeriare O Other

No Change in Task Required

Minor task modification task exemtially the same Only minor change in equipment/normaclature required.
Skell level change task exemtially the same but assigned to different will five! SKI

Frequency change same task but task is performed more (less) frequently dies to change in reliability, atc.
Major sask modification task characteristics (e.g., difficulty, importance) change ne. AA.

(C) Conceptual Modification

More than once a day Daily

Weekly

Monthly Thre to Six times a year Once or twice a year Less than once a year

Table C2 6 EXISTING TASK DELETION/ANDIFICATION WORKSHEET (continued)

MOS 63C	<u> </u>	COMMANDER'S MANUAL	ANUAL	· ·	F 1M9 6	FM9 63C6CM		ı	ļ	TASK MADD CODE	TASK DELETION CODE	NFW SKRL LEVEL	FXIST	NEW FREQ	SUBSYSTEM	UESIGN CHANGE NO	ADUTUMAL MEDIA	REI TASK CHAR SHFET
			INI		IRAIN	NG RE	TRAINING RESPONSIBILITY	HLITY										
			TIAL /EL	Ž	Ē	N.C.		5	UNIT				_					
			TRAINING	AIT BCT	FOJT PLC/PTT		 	- EU/CORI	TEC/CORI									
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Meterials																
Mointenance of T	Maintenance of Tracked Vehicle Hulls and				_													
Components				_				_	_						-			
N91 63C 1792	Remove and Replace Winch	TM 5 725,	<u>-</u>		Ε.	_			_	S Z				<u> </u>	Vinch Wire Rope			
001 630 1794	Translation Present	TM 9 2350 238 10		+	15	ī	-		+	 }			i					
	theaters	TM 11 6625 366 15	-		-	_				ن ع				<u> </u>	ersonnel Mesters			
091 630 3863	Supervise Inspection,		6	=	Œ			α		Ü				1 (d.)	ngine			
	Maintenance of Tracked	7M 38 750			_	_		_										
	Vehicle Engines	Applicable tracked vehicle TM	ĺ	_	- !				- 1								1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
091 63C 3864	Supervise Inspection and	FM 9 63C 1/2	Ē.	_		_		_		NC	-			ŭ.	ngine			
	Maintenance of Tracked	Applicable tracked vehicle TM	_		_	_		_			_					_		_
	Exhaust Systems	00/00		_	_	_		_										
P91 63C 3866	Supervise Impection and Maintenance of Fracked Vehicle Cooling Systems	FM 9-63C 1/2. Applicable tracked vehicle TM, TM 38 750	-	-	œ				-	ů Z					Goling System			
991 630 3866	Supervise Inspection.	FW 9 63C 1/2	-	-	<u> </u>	+	i	1	-	Į.		:	!	<u>سَب</u> : :	lectric Systems	1		
	Trusbleshooting, and Maintenance of Tracked Vehicle Electrical Systems	Applicable tracked vehicle FM, FM 38 750																
continued						_												
LASK JELETION CODE		14		}	i					=	FREQUENCY CODE			4				
		•									More then once a de-							
AUT Task Antomation	formation NRN	N. Minor task modification link essentially the same Only minus change in equipment/nomescalative required.	sentially red	ihe sen	ě	V Manage	change			· uc	Pally							
MF Change in	Change in Maintenance Policy SKI		ft the	į	girre ti	red fr	the same but assigned to different			٠ ي	Weekly							
O Other	196		but tack	1	Paul	more (ī			• "	There to Si	Menothly There to Sin times a vest	Ť					
(C) - Conceptual Addition		frequently due to change	ability, *	į	•	. :				~	Once or twee a year		į					
	MAJ	Major task modification importance) change	task characteristics is g difficulty	101101	ž •	(femily)				-	Less than once a year	May a son						
	(3)	Coursptual Modification																

er en esta despisa

Table C2.6. EXISTING TASK DELETION/MODIFICATION WORKSHEET (concluded)

												1										
SOM	38	COMMANDER'S MANUAL	IANUAL	1	2	FM9 63C/CM	CYCIN					TASK MOD: CODE	TASK DELETION CODE	NEW SKILL SKILL	FRED	NEW FRFQ		SUBSYSTEM	DESIGN CHANGE NO	ADDI TIONAL MEDIA	RFL TASK CHAR. SHEFT.	
			INIT		18.	Sinis	IG RE	SPON	TRAINING RESPONSIBILITY	1.4												
				=	INSTITUTION	1111	N.		_	CNIT	_											
			TRAINING	BCT	PLC/PTT	FOJT	 -	<u> </u>	TEC/CO						·							
TASK NUMBER	TASK DESCRIPTION	PRIMARY TRAINING Meteriah							R													
091 6 3C 3867	Supervise Impection. Troublethooting, and Maintenance of Tracked Vehicle Power Tains and Brake Systems	OS 726 FM 9-63C 1/2 Applicable tracked vahicle TM, TM 38-750	E			α			Œ			S N	ı	1			Power	Power Isakn				
p41 63C :4668	Supervise Impaction, Transbeshooting, and Maintenance of Tracked Vehicle Track and Suspension Systems	05 85. 05 729 FW ISSE 1/2 Applicable tracked vehicle TM, TM 38.750	е			Œ			<u> </u>			N C	f	1	i		Susp	Track and Suspension				
191 630 3868	Supervise Inspection. OS 729. Troubleshooting, and FM 98.3C Ministrance of Yasked Applicable Vahide Hulls and Component IM 38.750 Components	OS 729, FM 9 63C 1/2 Applicable tracked vehicle TM. TM 36 750	E			Œ			OK			υ 2	-	,			Com	Hulls and Components			·····	
191 f.3C 3070	Supervise Maintenance and Troubeshooting of Tracked Recovery Vehicle Hydraulic Systems	OS 729 TM 96 83C 1/2 Applicable tracked recovery vehicle TM TM 38 750	m	-		α			œ			Ü.					Ę H	Hydraulic Systems	1		: :	
LASK JELETION CODE		IASK MODIFICATION CODE										7.8	FREQUENCY CODE	DOF								,

TASK DELETION CODE	IASK	LASK MODIFICATION CODE
ELI Flimmation of Subsystem	¥	AC No Change in Task Required
AUT fast Automation	2	Minor lask modification task espenially the same Only minor chair In equipment/momenclature required
MP Change in Maintenance Policy	SKI	Shiff level change—task expensibility the same but assigned to differential fevel
O Other IC) - Commpted Addition	AEI	Frequency change same task but task is performed more (less) frequently dive to change in reliability, etc.
	#A1	Major task modification task characteristics leg. difficulty, importancel change
C- /	<u>5</u>	(C) - Conceptual Modification

FREQUENCY CODE	7 Mare than once a day	6 Delty	5 Weekly	4 Manibly	3 Three to Six times a year	2 Once of twice a year	I test than once a year
500E	ask Required	dification task essentially the same Unity menne change omenciating required	at task expectably the same that assigned to different		nge same task but task is parformed more (less)	to change in reliability, etc.	effication task characteristics to g., difficulty, unan-

equipment projected for ESPAWS and in the current manual mode (when the automated equipment breaks down). The manual performance of the task will not have to be performed as frequently as it currently is being performed; hence, it is marked by the "REL" code indicating only a change in task frequency is required. The automated performance of the task will be substantially different from the manual; hence it is marked by the "MAJ" code indicating a major task modification is required.

In addition to the task deletion/modification codes, the following information is listed for each task: initial skill level for which the task is trained; (2) the initial and advanced training locations for the task (3) the existing and projected new frequency for the task (this information is only listed for tasks which require a change in task frequency) (4) the subsystem associated with the task, (5) the design change number associated with the task (this information is only listed for conceptual system task (6) of the modifications), and the number task characteristic worksheet(s) associated with the tasks. task characteristic worksheets are used to provide more detailed descriptions of the tasks requiring major task modifications (i.e., the MAJ tasks) and the tasks with significant changes in task frequency (i.e., REL tasks which have different existing and projected task frequencies)1.

It is possible for a task to be marked REL and still have no difference between the listed, existing, and new task frequency. This reflects the fact that the frequency scale provides only gross classifications and does not capture small changes in task frequency.

Task characteristic worksheets related to reference task modifications are coded with an XXX-R-XX number. Task characteristic worksheets related to conceptual task modifications are coded with an XXX-C-XX number.

C2.2 Task Addition Worksheets

Tables C2-7 to C2-11 display the task addition worksheets which were used to describe the additional tasks, not currently being performed by Army personnel, which will be required for the ESPAWS reference and conceptual systems. The sheets list the projected additional tasks required for the ESPAWS reference/conceptual systems and the comparable task from which the projected task was based. In addition, the following information is listed for each additional task and its associated comparable task: (1) task number (2) initial skill level performing the task (3) initial and (4) task training locations related advanced and characteristic numbers2.

All additional tasks have associated characterist worksheets which provide more detailed information on the characteristics (e.g., skills knowledges associated with the task. Since all of the additional tasks are utilized in the reference system, each additional task has a reference task characteristic

For comparable tasks, the task number is taken directly from the commander's manual. For added tasks the first six digits are taken directly from the comparable task. These digits indicate the career field and location associated with the task. The next digit is identical to the skill level assigned to perform the task. The last three digits are used to distinguish the individual task from one another.

worksheet (marked by XXX-R-XX). In addition, those tasks which are associated with conceptual design changes also have a related conceptual task characteristic worksheet (marked by XXX-C-XX)³.

 $^{^3}$ The only type of task modification associated with the conceptual system were changes in task frequency (that is REL type task modifications).

Table C2-7. Task Addition Worksheet.

MOS 13B

Component

LAND NAVIGATION SYSTEM/ ESPAMS FIRE CONTROL COMPUTER

	Task Number	Tesk Description	Skill	Training Setting	Related Task Characteristic Worksheet
Task (Comp Tesk)	(061-270-1X08) (061-281-1000) (Note 13E Task)	Perform Operational Check of Land Navigation System Prepare FADAC for Operation	1	Q = AIT A = ANCOC, SELF, SCH Q = SOJT A = ANCOC, SELF, SCH	13B-R-18
Task (Comp Task)	(061-270-1X09) (061-281-1001) (Note 11E Task)	Operate Land Navigation System Enter Khown Data into FADAC	~ -	Q = AJT A = ANCOC, SELF, SCH Q = SOJT A = ANCOC, SELF, SCH	138-R-19
Task (C.mp Task)	(051-270-1X10) (051-281-1001) (Note 13E Task)	Operate ESPAWS Fire Control Computer Enter Known Data into FADAC	~ -	O = AIT A = ANCOC, SELF, SCH Q = SOJT A = ANCOC, SELF, SCH	13B-R-20
Task (Comp Task)	(061-270-1X11) (061-281-1000) (Note 13E Task)	Prepare ESPAMS Fire Control Computer for Operation Prepare FADAC for Operation		Q = A1T A = ANCOC, SELF, SCH Q = SOAT A = ABCOC, SELF, SCH	13B-R-21
Trsk (Cump Task)					

Table C2-8. Task Addition Worksheet

MOS 31V-1

Component

ESPAWS LAND NAVIGATION SYSTEM (LNS)

	Task Numbar	Task Description	Skill	Training Setting	Related Task Characteristic Worktheet
Task	113-80X-1X01	Test LNS Equipment Interface and Signal Flow	-	0 - 310XZ A = SOJT, SELF, TCC	31V-R-1
(Comp Task)	(113-574-2058)	Operate Radio Test Set to Test Modules in AN/URC-12 to a Defective Component, Cable or Accessory		Q - AIT A = SOJF, SELF, TYC	
Task	113-80X-1X02	Test Attitude Control Loop/Outputs		P to t	31V-R-2
(Comp Task)				A = SOJT, SELF, TCC	
Task	113-80x-1x03	Test LNS Modes Operation	-	0 = 31VXZ A = SOJT, SELF, TCC	31V-R-3
(Comp Task)	(113-574-2658)	(As Above)	-	Q = AIT A = SOJT, SELF, TYC	
Tesk	113-80x-1x04	Calibrate LNS Compass	-	Q = 11VX2 A - SOJT, SELF, TCC	31V-R-4
(Comp Tesk)	(113-574-3036)	Evaluate Operation of Radio Set MN/VRC-46	~	O = 310XZ A = SOJT, SELF, TCC	
Task	11 3-80X - 1X05	Troubleshoot LNS and System Displays	-	9 - 310XZ A - SOJT, SELF, TCC	31V-R-5
(Cump Task)	(113-609-0099)	Systems Troubleshoot COMSEC Security Equipment TSEC/ KY-52 with an AN/VRC 12 or AN/VRC 47 Radio	-	9 - Alf A - SOIT, SELF, TCC	

Table C2-8. Task Addition Worksheet (continued)

MOS 31V-1

Component

ESPAWS LAND NAVIGATION SYSTEM (LNS)

	Task Numbar	Task Description	Skiil	Training Sotting	Reluted Task Characteristic Worksheet
Task	113-80x-1x06	Remove and Replace LNS	-	Q = 31VX2 A = SOJT, SELF, SCH	31V-R-6
(Comp Task)	113-609-1034	Install COMSEC Equipment TSEC/KY-57		n n	
Task	113-80X-1X107	Inspect INS		Q '= 31VX2 A = SOJT, SELF, SCH	31V-R-7
[Comp [ask]	(113-587-3028)	Evalute the Operation of UF Radio Set AN/VRC-12		Q = AIT A = SOJT, SELF, SCH	
Task					
(Comp Task)					
Task					
(Conp Task)					
Task					
(Cump Task)					

Table C2-9. Task Addition Worksheet

MOS 31V-2

Component

H ESPANS FIRE CONTROL COMPUTER

	Task Number	Task Description	Skeil	Training Setting	Related Task
					Characteristic Worksheet
Task	113-70X-1X08	Evaluate the Operation of the ESPAMS Computer	-	Q = 101ASIX1 A = SOJT, SELF, SCII	31V-R-8
(Comp Task)	(091-34G-1440) (Note 34G Task)	Test M18 Gun Direction Computer Using Test Tape B	-	Q = AIT A = SOJT, SBLF, TCC	
Task	113-70X-1X09	Remove and Replace Communication Data Link of ESPAWS Computer	-	Q = 101ASIX1 A = SOJT, SELF, TCC	31V-R-9
(Comp Task)	(113-609-1034)	Install COMSEC Equipment TSEC/KY-57		Q = AIT A = SOJT, SEUF, TCC	
Task	1!3-70X-1X10	Remove and Replace Wind Velocimeter and Other Sensors Associated with ESPAWS Computer		Q = ASIXI A = SOJT, SELF, TCC	31V-R-10
Task)	(113-609-1034)	Install COMSEC Equipment TSEC/KY-57	1		
Task (Comp Task)	113-70X-1X11 133-609-1034	Remove and Replace ESPAMS Computer Install COMSEC Equipment TSEC/KY-57		Q = ASIXI A = SELF, SOJT, SCH Q = AIT A = SELF, SOJT, SCH	31V-R-11
Frak (Comp Frak)	(113-70X-1X12)	Repair ESPAMS Computer Terminals and Displays Repair Switchboard Telephone Manual	-	0 - ASIX) A - SELF, SOJT, SCH Q - ATT/OSUT A - SOJT, SELE, TCC	31V-R-12

Table C2-9. Task Addition Worksheet (continued)

ESPAWS FIRE CONTROL COMPUTER

Component

11V-2

Related Task Characteristic Worksheet 31V-R-13 ASIXI SELF, SOJF, SCH AIT SOJT, SELF, TCC Training Setting i. P p n 0 4 0 < Skill Test M18 Gun Direction Computer Using Test Tape B Isolate Paulty Module of ESPAWS Computer Using Built-in Fault Isolation Subroutine Task Description (091-34G-1440) (Note 34G Task) (113-70x-1x13) Task Number (Comp Task) (Comp Task) (Comp Task) (Cump Fask) (Comp Task) Yask 7 Task Task 7.5k Task

Table C2-10. Task Addition Worksheet

MOS 45D (13BU6)

Component

ESPAWS AUTOLOADER

	Task Number	Tesk Description	Skill	Training Setting	Related Tesk Characteristic Worksheet
Task	061-272-1X01	Adjust ESPAWS Autoloader	_	Q = 643-45D10 (MOD) A = BNCOC, SELF, SCH	45D-R-1
(Comp Task)	(061-270-3429)	Adjust the Equilibrator on the M109/N103Al	_	Q = SOJF A = BNCOC, SELF, SCII	
ž	061-272-1X02	Repair Hydraulic Components of the MK XXX Autoloader	-	0 * 643-4510 (MOD) A * SOJT, SELF, SCH	45D-R-2
(Comp Fask)	(061-270-1473)	Repair Hydraulic Tubes and Fittings to Elevation and Bquilibrator Systems (M109/M109A1)	-	Q - 13BU6 A = SQJT, SELF, SCH	
Tes.	061-272-1x03	Repair Electrical and Electronic Components of the ESPAMS Autoloader	-	Q = 643-45010 (MOD) A = SOJT, SELF, SCH	4510-R-3
(Comp Task)	(061-270-1466)	Repair Components of the M109/M109Al Howitzer Cab Electrical System	-	Q = 13BU6 A = SOJT, SELF, SCH	
Task	061-272-1X04	Adjust/Align Autoloader Loader Drum Clutch and Index Rack	-	Q = 643-4510 (MOD) A - SOJT, SELF, SCH	45D-R-4
(Comp Task)	(061-270-1465)	Blend and Charge Elevating/ Equilibrating Mechanisms of M109/M105A1	-	Q = 13BH6 A = SOJT, SELP, SCH	
Task	3 071- <i>c1</i> c-130	Adjust Upper Hoist Shutters and Carrier Rjectors for Proper Action	-	9 - 648-45010 A * 30JT, 3BLF, SCH	45D-R - 5
(Gunp Task)	(061-270-1462)	Adjust Rommer Control Assembly on M107	-	Q 13BU6 A · SOJT, SELF, SCH	

Table C2-10. Task Addition Worksheet (continued)

ESPAMS AUTOLOADER

Component

MOS 450 (13BU6)

Related Task Characteristic Worksheet 45D-R-6 643-4510 (MOD) SOJT, SELF, SCH 13Bu6 SOJT, SELF, SCH Training Setting 0< 0 < Skill Repair Components of M109/ M109Al Howitzer Lab Electrical System Inspect Autoloader BITE Components Task Description Task Number 061-272-1X06 061-272-1466 (Comp Task) (Comp Task) (Comp Task) (Comp Task) (Comp Task) Task Jask Task Task Lask

Table C2-11. Task Addition Worksheet

MOS 451.X1

Component

ESPAMS AUTOLOADER

	Task Number	Task Description	Skill	Training Setting	Related Task Characteristic Worksheet
Task	091-452-7X01	Operate the ESPAMS Autoloader in Load Mode	-	Q - 642 AST X1 A = SOJT, SELF, SCH	451,-18-1
(Comp Task)	N/A	Operate Gun Mount 5"/54 MK 42 MOD 98 10 Gun Loading System in Load Mode	~	Q = MK 42 Gunners Mate School A-113-0044	
Task	091-4511X02	Porform Preventive Maintenance on the MK XXX Hoist, Cradel, Transfer Trays, Rammer, and Slide	-	Q = 642 ASI XI A = SOJT, SBLF, SCH	451R-2
Task)	N /A	Perform Planned Maintenance on the 5"/54 MK42 MoDlo upper gun loading system		0 = MK 42 Gunners Mate School A-113-0044	
Task	091-45L-1X03	Isolate and Correct Faults in the MK XXX Loader Drums	-	O + 642 ASIXI A + SOJT, SPLF, SCH	451,-18-3
(Camp Task)	۷/۷	Troublechoot the 5"/54 MK 42 Mob 10 Loader Drums	~	Q = MK 42 Gunners Mate School A-113-0044	
Tusk	091-451,-1X04	Isolate and Correct Faults in the Hoist of the MK XXX Autoloader	_	0 - 642 ASTX1 A - SOJT, SELF, 3CH	45L-R-4
(Conp Task)	н/л	Troubleshoot the 5"/54 MOD 10 upper Hoist MK 2	~ :	0 - HK 42 Gunners Mate School A-113-0044	
Task	091-45L-1X05	Feelate and Correct Faulte ia the MK XXX Autoloader Cradles	-	Q 642 ASTX1 A SOJT, SELF, SCH	451R 5
(Comp Tack)	H/A	Troubleshoot the 5"754 MK 42 Mote 10 Cradies	^	g - MK 42 Gunners Mate School A 113 0044	

Table C2-11. Task Addition Worksheet (continued)

ESPAWS AUTOLOADER

Component

MOS 451,X1

	Task Numbar	T.sk Description	Skill	Training Setting	Related Task Characteristic Worksheet
Task	091-451-1806	Isolate and Correct Faults in the MK XXX Autoloader Transfer Trays	-	Q - 642 ASTXI A - SOIT, SELF, SCH	451,-P-6
Task)	4 /2	Troubleshoot the 5"/54 MK 42 MoD 10 Transfer Trays	٠	O = MK 42 Gunners Nate School A-113-0044	
Fask	091-451,-1X07	Isolate and Correct Faults in the MK XXX Autoloader Rammer		Q 642 ASIX) A SOJT, SELF, SCH	451,-P7
(Comp Task)	V , V	Troubleshoot the 5"/54 MK 42 MOD 10 Rammer HK 2 ROD 3	,	Q - TIK 42 Gunners Mate School A-113-0041	
Task	80X1 -45P-460	Teolate and Correct Faults in the MK XXX Autoloader Slide	-	O - 642 ASTXI A - SOLP, SELF, SCH	451, R·B
(Cump Task)	V 2	Proubleshoot the 5"/54 MK 42 MOD 10 Slide MK 31 MOD 3	^	9 - MK 42 Gunner's Hale School J. 113-0041	
Fask	091-4511809	Test the Operarion of the Hall Effect Proximity Switches Used in the ESPANS Autoloader.	-	Q 642 ASTXI A = 5047, SELF, 3CH	451, R-9 451,-C-1
(Conp Task)	091-45E 1401	Porform a Continuity Test of an Electrical Circuit Using a Multimeter		Q ALT A SOUT, SELE, SOU	
Task (Comp Task)	04021-737-160	Test the Operation of the Entching Relay Circuit, and Selonoid begins Circuit, and Selonoid the Evicuit Card Tester is XXX	• -	Q 6.4 7831 (1 A 30.17, 319.17, 30.11	4512-18-10 4512-0-7

"Continued on next page,

Table C2-11. Task Addition Worksheet (continued)

ESTANS AUTOLOADER

Component

MOS 151,X1

APPENDIX C3 TASK CHARACTERISTIC WORKSHEETS

This appendix describes the task characteristic worksheets that were used to describe the characteristics of the modified and additional tasks identified in the task modification/addition worksheets listed in Appendix C2.

The appendix is divided into two sections. The first section describes the task characteristic worksheets which were used with tasks which only required a change in task frequency. The second section describes the task characteristic worksheets which were used with tasks requiring major modification or where new tasks were developed specifically for ESPAWS.

C3.1 Task Characteristic Worksheets A

A separate set of worksheets (task characteristic worksheets A were used to describe the characteristics of the tasks which only required a change in task frequency (the tasks identified by the code "REL" in the task description worksheets in Appendix C2). Since only the frequency with which these tasks are performed changes, and not any other essential features of the task, a detailed description of the skills and knowledges of these tasks is not required. Hence, these tasks do not require the detailed description that the other modified and additional tasks require.

Table C3-1 lists the task characteristic worksheets which were developed for the ESPAWS REL tasks. Each one of these worksheets lists all of the reference or conceptual tasks

Tash Characteristic Worktheet No. 138 B.2

lest Type REL

System Associated with REF

MOS 13R

Tesh	Task	Frin	New York	Ę,	lmport	Intial Training Location	Location	Advanced fraining Location	Location
Number		Freq	Fred	culty	S. HCr	Exist	New	Exist	N:
061.268.1101	Emplace/recover collimator	•		TON	YES	AIT/OSUT	AIT/0SUT	SOJT, SFLF, SCH	SOJI, SELF., SCH
061 266 1103	Emplace/recover alming posts	•	e	NOT	YES	AIT/OSUT	AIT/OSUT	SOJI, SFLF, SCH	SOJT, SF1.F., SCH
041.266.1215	Selfby the connow for quantum with the range quarkent	•	6	gow.	YES	tros	sour	BNCOC, ANCOR:	BNCOC, ANCINC
061 266 1216	Messure the quaritant with range quaritant	4	60	GOM	YES	SoJI	SOIT	BNCUC, ANCOC	BNCCC, ANCOC
061 266 2168	Fire the carnon (manual)	•	6	MOD	YES	AIT/OSHIT	SOJF.	SOJT, SELF	SELF, SCH
061 286 1219	Clean the provuler chamber after fixing	•	m	NOT	YES	AIT/OSIIT	sour.	SOJT, SELF	SELF, SCH
061 266 1401	Inspect and clean the collimator	•	e	NOT	YES	AI1/08UT	A1T/OSUT	SOJT, WELF	SOJT, SFLF
061 266 1402	Inspect and clean ainsing posts and might lighting deciras	*	m 	TON	YES	AIT/OSUT	A11/0\$UT	SELF, SCH	SELF, SCH
061 278 1514	Luad a prepare? round for fining in M109/M109 A1 (manual)	•	6	MOD	VES	AIT/OSUT	*Tros	SOJI, SELF. SCH	SELF, SCH
061 268 1452	Purys and charge lies control equip.	•	•	VERY	YES	13806	sout.	SOJT, SELF, SUH	SELF, SCH
061 266 2221	Lay the common for United Ulrection of the	•	n	VERY	YES	Tros	SOJE	ANCOC, SELF,	ANCOC, SFIF,
N61 266 2223	Aliga coffinatre/siming posts	•	e -	VERY	YES	SOJI	sort	ANCOC. SELF.	ANCOC, SELF.
9252 568 2558	Scificy the cannon for deflection fuminal)	•	6	VERY	YES	ros	Jros	ANDOC, SELF,	ANCOC, SFLF,
061 266 2231	Refer the place	•	e	MOD	YES	Sout	¥09	ANCOC, SELF.	ANCOC, SELF.
061 270 2225	Borevight the pairoxamile telescope using distant anning point	•	6	VERV	YFS	11.08	SOJI	SELF, SCH	SCH SFIF, SCH
061 270 2228	Receight the penosemic telescope using testing target	•	6	VERV	VES	ros	Tros	SELF, SCH	SFLT, SCH
061 266 3304	Varify emplanment of aiming points and recuriting of deflactions		6	WOD	YES	BNCOC	BNCOC	ANCOC, SOJT,	ANCUC, SOIT,
061 266 3110	Perform gamon's micrometer test	·	6	VERY	YES	BNCOC	BNCOC	ANCOC, SOJI,	ANCOC, SOUT,
061 266 3110	Perform ganner's equalitates werd to nevel tont	•	6	VFRY	YES	GNCOC	BNCOC	ANCOC, SOJT.	ANCOC, SOLIT.
061 286 3318	Set/lay for clus-trant with quinner's quarkant	•	F.	VERY	YES	BNCOC	BNCOC	ANCOC, SOJT.	ANCCC, SOJT,
061 266 3319	Phenus the quadrant with general's qualrant	•	m	VERY	YES	RNCOC	PNCOC	SELF, SCH ANCOC, SOJT,	ANCOC. SOJT.
061 270 3307	Perform lies control alimnment tests on M109/M109 A1		6	VERY	YFS	SO.T	3011	SELF, SCH BNCOC, SELF,	BNCOC SELF
								SCH	SCH
		-		_	_			_	_

·C-62

*New training assignments different from previous assignment

Table C3.1 Tark Characteristic Worksheets - A (continued)

System Associated with CONCEPTUAL

Test Characteristic Worksheet No 138.

tot Type REL

MOS 133

First Cuty Parts Cuty Parts Cuty Cuty		Tesh	<u> </u>	f zin	N.	DIN	Import	Initial Training Location	Location	Advanced Training Location	Training Location
Regular advinural wiring farment countral water 5 2 MOD VES 138046 4FOTO SCI. SCI. SCI. SCI. SCI. SCI. SCI. SCI.		Number				culty	a) C	į	. z	Exist	<u>}</u>
Region schindred belond of combined belongs of control where 3 7 MOD VES 13806 6001 5007 SEV. SCV. Region activities where 3 7 MOD VES 13806 6001 SEV. SCV. SEV. SCV.								[]			
Reposit and/funct whereal beaments 3 7 MOD VES 1380-06 460010 50.1f. SELF. SELF.		961 270 1468	Replace solenoid or combined solenoid and rammer control valve	-	~	QQW	YES	1380	45010	SOJT, SELF, SCH	SOJI, SFIF
		061 270 1474	Repoir cah/lurrat wiring harmes	e	^	dow	YES	13806	45010	SOJT, SELF, SCH	
		-									
		-									
								,		. —	
		-		.=.				-			
										-	
										_	
								-			
	_			,-							
								-	-		
								_		·	
					_			-			

SOJT, SELF. SCH SOJT, STLF. SCH

Toth Type REL.

MOS ... 41C

Tak		xist	-	100	<u> </u>	Initial Fraining Location	ncetion	Advanced Training Location	location
Number		F.2	F. saq.	culty	8	Enin	New	Enist	
091-410-1401	Perform torque inspection of caltimator M1			QOM	YES	AIT	AIT	rour	rour
091 410-1403	Charge infinity collimator M1 with nktrogen	-	е	dow	YES	Į.	AIT	rour	roır
091 41C 2404	Replace theorist in temote control light source of collimator	-	m	dow	YES	AH	AIT	roı	roı
091 410 1445	Repair aiming posts	-	m	OOW	YES	J.V	N AIT	FOJT	rou
091 410 1571	Troubleshoot cross-level mechanism in fise control quadrant	•	е.	VERY	YES	AIT	AIT	FOJT	FOJI
091 41C 2572	Replace hans wormshaft in fire control quadrang M15	•	е.	GOW	YES	AIT	AiT	FOJT	TLOT
091 410:1580	Troublettons penoremic telescope	-	m	VERY	YES	AIT	AIT	FOJT	FOJT
091 41C 1581	Charge paramet releasone M115 with altrogen	•		MOD	YES	AIT	AIT	FOJI	FOJT
091 410 1582	Replace randed fets in eye piece of parviamic telescripe	•		OOM	YES	AIT	AIT	FOJT	101
091 41C 1600	Install telescape mount M145 in M109	4		dow	YES	AIT	AIT	FOJT	FOJT
1901-110-1601	Synchronize telescope mount M145 in M109	•	۳	dOM	YES	AIT	¥.	FOJT	FOJT
	The form of the second]			1				

(continued) Table C3.1 Task Characteristic Worksheets - A

i

MOS 45C

Tush Characteristic Worfisheet No. 451.C.1

Task Type HEL

System Associated with CONCEPTUAL

T.

Tesh Number

SOJT, SFLF. SCH SOJJ, SELF. SCH Advanced Training Location Exist (NAVY)

Test operation of latching relay circuit, and solennich chiver choult cards

091 45L 1X10 091-45L 1X09

Overate the Hell Effect proximity switches in ESPAWS autoloxies

Location	New	642ASIX1	642ASIX1	
Initial Training Location	Exist	(NAVY)	(NAVY)	
fmport	action.	YES	YES	
Diffi	culty	MOD	ООМ	
New	Fred	3	e.	
Faint	Frag	-	•	

*New training enigements different from previous singument

Table C3.1 Task Charecteristic Worksheets .. A (concluded)

MOS 63C

System Associated with CONCEPTUAL

Task Type REL

Exist. Freq.	New Fred	Diffi. culty VERY	Import.	Exist New New Ass	Import. Exist Now Exist VES All All All Colf	Advanced Train Exist
f req.		culty VERY	v KES	Exim	New	Eulet
-	e e	WERV	VES	AIT	AIT	rour
•	e.	MOD				
			YES	AIT	AIT	FOJI
16	•	MOD	ves	AIT	AIT	FOJT
•	<u> </u>	MOD	YES	AIT	717	FOJT
-						
un 🔻	4 6		dow dow		Y YES	YES AIT YES AIT

FOJT FOJT FOJT

'New traiming assignments different fenm previous assignment

associated with a particular MOS. For each REL task, the following information is listed: (1) task number (2) the existing frequency with which the task is performed, (3) the estimated difficulty of the task (4) the estimated importance of the task, (5) the initial and advanced training locations for the existing task and (6) the initial and advanced training locations for the task with its new frequency. 1

C3.2 Task Characteristic Worksheets B

Table C3-2 provides an example of the type of detailed describe the worksheets that were used to task characteristics of the additional tasks or the tasks requiring major modification. To save space, only one example of these worksheets is provided. (The number of these worksheets is quite large.) Each worksheet has two pages. The first page lists the modified or additional task being described and the comparable existing task used in deriving this new task. For both the new and comparable task, the following information is listed (1) task number skill level, (3) initial and advanced training locations, (4) associated media, (5) the frequency, difficulty, importance and duration (optional) of the task and (6) special support equipment, tools, etc., associated with the task.²

The term "existing frequency" only refers to the current Army frequency when one is dealing with reference REL tasks, however, for conceptual REL tasks, it refers to the frequency with which the reference tasks were performed. This latter frequency may not be equal to the current task frequency if the frequency of the reference task itself changed.

Table C3-2. Task Characteristic Worksheet B - Example.

19h SOM	Associated Subbyssem ESPAWS Autobader	Associated Frequency Difficulty Importance Duration SupportTess Media (Optional) Equip. Tools	TBD MOD. WOD. Yes - Multimeter		MOD. Yes - Multimeter
		Additional Training Location	Sour		100
		Initial Training Location	642.ASIX.1		Nuv Course A 113 0044
ADD	Conceptual X	SAR	-		2
REL MOD	X X X	Tesh	holese faults in the hoist of the WKAKA Autologethe	UIA.	Troubferhoot the 5"/54 MK42 MOD 10 Utrper host MK2
Tab Type REL	Svitem Auscieled with: REF:			STAPARABLE TASK DATA	WA

Table C3-2 (continued)

Task Characteristic Worksheet B -- Example

SKILLS AND KNOWLEDGES ASSESSMENT

Relevant skills and knowledges from comparable task:

1.1 Perform voltage checks with a multimeter

1.2 Perform circuit continuity checks with a multimoter

1.3 Describe Principals of hydraulic operation 1.4 Describe general safety precautions

Additional skills and knowledges required: ~

2.1 Describe mechanical functioning of the hoist

2.2 Describe hydraulic functioning of the hoise

2.3 Describe control circuits functioning of the hoise

2.4 Identify the steps and step sequence for testing the hoise 2.5 Identify correct test results

2 6 Analyze the hoist test results

2.7 Identify hoist information in the MKxxx autoloader reference manuals

2.8 Identify relevant circuit card inputs and outputs

2.9 Identify autoloader hoist specific safety precautions

2.10 Perform parts replacement and removal

Page two of the task characteristics worksheets-B lists the relevant skills and knowledges required by the new task. These skills and knowledges are broken down into categories: (a) those which are equivalent to the skills and knowledges associated with the comparable task and (b) the additional skills and knowledges required by the new task.

 $^{^2\,}$ The media associated with each task are not listed in the example because the media associated with the modified or additional tasks were not identified in this phase of the ESPAWS study.

APPENDIX C4 COURSE MODIFICATION/DEVELOPMENT WORKSHEETS

This appendix describes the worksheets that were used in modifying existing courses and developing new courses. The appendix is divided into two sections. The first section describes the worksheets used in modifying existing courses while the second section describes the worksheets used in developing new courses.

C4.1 Course Modification Worksheets

Three courses were modified for the ESPAWS reference/conceptual systems: Field Artillery Crewman Course (041-13B10); the FADAC Course (101-ASIF7) which was modified to develop the ESPAWS computer course (101-ASIX1); and the Field Artillery Turret Mechanic Course (643-45D10). The modified course developed for the reference system were again used in the conceptual system without further modification because no significant difference between the reference and conceptual system tasks was projected. Tables C4-1, C4-2, and C4-3 list the course modification worksheets for each of the three modified courses.

Each of the course modification sheets lists all of the course modules/elements from the existing course and the additional course modules/elements required to meet the task, skill, and knowledge requirements of the equipments associated with the projected course. For each course element, the following information is listed (1) hours of instruction for the course element in the projected course, (2) hours of instruction for the course element in the

Table C4.1 Course Modification Worksheet Retarence, Conceptual

Ref.reace, Conceptual			1	Course 041-13810	MOS 138	
Properted Courter Bennants	Hours	Type of Instruction	Current Hours	Current Types of Instruction	Mediatis/Courses Used to Project Actival Mediates	Related Tasks
School of Sobiler Wespon, Training Combat Skift and Tech Artiflery Common	78 65 117 70		28 66 117 00			
ortingen tage in Prepare Canon Annausion for Fring in Introduction to PMLO	222	1C 2PE1 2SG, 1,75PE1	3 6 5 3	10 2nE1 25C, 1,75PE1 2.0 PE1	Prepare cannon ammunition for firing	NGT 266 1506 (MODI, DG1 266 1504/(ADD)
o Operation of Power/Hammer Brech of Operation/Function of Autofrader of the Control Equip. Dutes of Cannancer of butes to Cannancer of the Dock MG	(2) (2) (30) (20)	2 0PE 1 2 0PE 1 3 0PE 1 2 0PE 1	(2) (2) (3) (4) (2) (2)	2 OPE1 2 SFE i 4 OPE1 2 OPE1	Operation/Function of Autoloader	061 270 1614 (MDD) 061 266 1218 (MDP) 061 266 1218 Manual (I)EL 061 270 1514 (MDD), 061 266 1219 (I)EL 061 270 1514 Manual (I)EL
o Safety Procedures o Ratter Mantenance Fire Courted Comp o MITO Courted Comp Monacadeonic Subtratal (SF Freek) Furial Laming firms (week)	(1.0) (9) (1.22) (3) (1.54) (1.54) 78.5 50 500 0	1 0C 2.2PE 1 3PE 1 3.5E 1 1	(10) (11) (20) (0) (13) 78 51.0 497.5 12.4 weeks	1.0C 11.0C 		061 268 1 ULUMUD), 061 266 1701(MNU) 061 266 1707(MN) 016 270 1X08(ADD), 061 270 1X 11 (ADD) 061 270 1X08(ADD), 061 270 1X11 (ADD)
				:		

Table C4.2. Course Modification Worksheet Riderence, Conceptual

Projected CR21M Introduction to deptal comparers Introduction to deptal comparer Introduction to deptal comparer Introduction to deptal comparer Introduction to deptal comparer CR21M Mill Comparer to Communication to SPAWS Comparer CR21M Mill Comparer Mi		-		
Orection 9 Orection 9 outral Circuits 0 Computer Field 84 Computer		Current Typer of Instruction	Madukti)/Causes Uded to Propert Added Medutes	Related Tasks
10 0 0 10 10 10 10 10 10 10 10 10 10 10		14D, 3F	digital computers	, ; 1
Aures 10 0 10 10 10 10 10 10 10 10 10 10 10 1	*	1C, 24TV, SPE1	CR2)AC	Dwinte
Aures 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	B.4	1C, 241V, SPE1	Introduction to M18 Gun Direction Computer Maintenance	113 70X 1X09 113 70X 1X10 113 70X 1X11
Communerations Data Link to Communerations Data Link to Communerations of Check of Mills Computer Lings Trindblesharoting Lings Trindblesharotin		9C, 4 1PE1		Delete
ad Check of MM8 Computer* 75 Monthly and replacement* proceedures 75 Longer Freinblechmoting* 9 Longer Freinblechmoting* 229 Longenter Triublechmoting* 75 Inname	un	.9C, 41PE1	CR27AG M18 Computer Power Control Circuits	113 70X 1X10 mld +5 hrs
PAMS Computer Logic Foutbleshanding Longic Foutbleshanding 175 175 187 188 188 188 188 188	7.5	8C, 6.7PE1	CD33411	
Lingui Frinkherhanding 9 Limpuler Triukherhanding 229 Limpuler Triukherhanding 229 Inn 75 Inn 75 Inn 75 Inn 16 Inn 17 Inn 18	7.5	8C. 6 7PE1	Operational Check of M18 Computer	113 70X 1X11
Comparies Trachtechantung* 229 15 15 15 16 16 175 175 18 18 18 18 18 18 18 18 18 1	6	96	CR27AO Diagnostir Logic Troubleshouting	113 JOX 1X12 Not
7.5 1100mg.a.ph. Maintenance () 80 80 80 60 60 60 60 60 60 60 60 60 60 60 60 60	22.9	90, 22PE1	CR27AS M18 Computer Troublestworting	113 70X 1X13 Net
10 589 80 80 80 80 80 80 80 80 80 80 80 80 80	7.5	7 5€1	CR2702 Examination	Eramination
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
80 60 60 60 60 75 75 14 Works	£8			
France 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0			
Numeradenne 196 75.5 ng lime to Wenke 189 works				
75.5 rg firms to Weeks	16.8			
1 89 weeks	112			
Introduce Breakdown	28 works			
PE1 - 419 1	teahdown:	Instructional Brankdown, pt. 1 - 57 8 1V - 2 6 C 7 7 F - 3 7 F		

Table C4.3 Course Madification Workshoot Reference, Conceptual

MOS 460 (13848)

643 450 10

Course

		francisco de la companya de la compa		1	The care of the control of the same of the control of the same of the control of	
				Current	Module(s)/Courses	
Projected Course/Elements	Hours	Type of Instruction	Hours	Types of fostruction	Used to Project Added Medules	Related Tasks
of beaning than Marine	23	81C 1,4TV 16PE1, 76PE3.	23	8 1C, 141V, 1.5PE1, 7 8PE3,		
		1.0PE2, 1.00D, 2E1, 4TF		1.0PE2, 2.0E1, 4TF		
MIIID Series Hardtzer	R	3.2C, 20.4PE1, 2.0PE3, 3E1, 4TV	2	3.2C, 20,4PE1, 2.0PE3, 3F1, 4TV		
Mescellaneous Subjects	E E	2.5C, 10PE1, 5TF	13	2 5C, 10PE1, 5TF		
ESPAWS Howitzer						
o Fertorm Main of Birech Mech	9	6C, 5.2PE1, .2PE3	(9)	6C. 5.2PE1, 2PE3		
o Renove/Install Breech Block	8	SC. 5 3PE1, 2PE3	9	5C, 5 3PE1, .2PE3		
n Adjust Operating CAM	₹	.4C, 3.4PE1, 2PE3	₹	4C, 34PE1, 2PE3		
e' Pure fire Control fest ?	ε	1.00	(2)	SC, 4.2PE1, 3PE3	Perform Fire Control (M109) 643 4510	081 266 1457(DEL)
o Remove/Install Tel Mount (M145)	<u>ē</u>	SC, 5.2PE1, 3PE3	9	6C. 5 2PE1, 3PE3		
n Adjust Felescupe Munns	(01)	1.5C, .4TV, 7.8PE1, .3PE3	(0.1	1 6C, ATV, 7.8PE1, 3PE3		
o Buplace Hydrauht Components	60.	1.3C, 8.2PE1, 5PE3	8	5C, 3.3PE1, .2PE3	Replace Hydreulic Comp (M109) 643 4510	061 272 1x02(ADD)
n Perform Styp Ring Contact Maint	110	1.5C, 4TV, 7.8PE1, 3PE3	(10)	15C, 4TV, 78PE1, 3PE3		
u Traubleshoot Flect Systems	(30)	1 9C, 17 8PE1, .5PE3	(18)	15C, 14,1PE1, 4PE3	Troubleshoot Elec. Systems (M109) 843 4510	061 270 1468(MOD), 061 272 1X03(ADIV)
n Hrpan Autohoader		.BC, 6 7PE1, 5PE3	;	,	Replace Rammer Trav. Mech (M110)643.4510	061 270 3436(MOD 1,061 272 1X01(ADD)
" Exam"	Ē	1161	6	961		061 272 1X04(ADD),061 272 1X05(ADD)
(60) M (103)	85		92	-		081 272 1X06(ADD)
End of Course Exam.	17.0	17 0€1	ي	16E1		
Total Academic	174		157	• * •		
In/Outral Processing	***		•			
Physical Court	~	-	12	٠		
Dpen Time			to.			
Commission of Time	•		20			
Total Monacademic	æ	8				
Training Time Weeks	210 5.2 wks		192 4 B wks	-		
		Instruction Itme Breakout		Instruction Time Breakout		
		238		213		
		PE1 895		~		
		PE2 10		-		
		FE 3 12.2		FE2 10		
				900		
	-		1	: :::		The state of the s

projected course broken down by instructional method, (3) hours of instruction for the course element in the existing course, and (4) hours of instruction for the course element in the existing course broken down by instructional method. In addition, for all modified, or additional course elements (identified by stars in the table), the sheets list the existing modules used to develop these modules, the courses associated with these existing modules, and the reference/conceptual tasks related to these modules.

At the bottom of each sheet, total academic hours, nonacademic hours, and total training time both in hours and weeks, are listed along with a breakdown of the total academic hours by instructional method for both the existing and projected course.

C4.2 Course Development Sheets

Two completely new courses were developed for the ESPAWS reference/conceptual system: ESPAWS Land Navigation Computer Maintenance Course (101-ASIX2) and the ESPAWS Autoloader Maintenance Course (642-ASIX1) As with the modified courses, the new courses developed for the reference system were used again in the conceptual system without modification. Tables C4-4 and C4-5 list the course development worksheets for each of the two new courses.

The course development worksheets list the course elements/modules projected for the new courses. Along with the following information associated with each course module: (1) The total instructional hours for each module, (2) the instructional hours for each element broken down by instructional method, (3) the student instructor ratio

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MOS 451.X1 Reference

Related Tesh Numbers

091 45L 1X01,2,3,4,5, 6,7,8,9 081 45t 1X01,2,3,4,5,6, 7,8,9,10

091 4b2 1X01 J91 462 1 X21

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	Course	Type	S A					ž			ď.		٧ ٧		Y Z						Ą.								
	rom Existing	Hours	4 Z					Ą.			A A		4 2		A S						Ą.								
	Neitweit Modules from Existing Course	Module	MK42 MODB41G Gunner's Mate School Operate Gue Mount 5"54 MK42 Mod 9 & 10	Gas Louding System in Load Mude.				MK42 MODBE10 Gunner's Mate School	Perform plumed maintenance on you nount 5'/64		MK42 MOD9&10 Gunner's Mate School	Describe the operation of the Hall Effect proximity switches	09-451, 3412. Use electric drive control last set to	modely mathematically components of turist electrical system of AH/AAUS1	MK42 MUD9610 Gunne's Mate School	Troubleshoot the 5"/64 MK42 MOD19 loader druins					Troubleshoot the 5"/54 MK AKID10 upper hout MK2								
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	Hours		1.7	9.1	4.1	2.8		116			53		34		7	, 91	;	-	ţ		607		5.53	}	183				
and the second s	Course Markets		Identify Autohoder Compounts	Follow Anniumlium Handling, Electrical. Personnel, and Hydraulic Safety Precautions	Identity the control passed switches and sand sand sand sand sand describe their parpose/function	Operate the MKana Automatic Loading System	4	- Photos	D. Cradel	d Manual o Made	Test the operation of the Mall Effect proximity	swithes used in the Mhann cuittol circuits	fust the operation of the fatching relay circuit,	high theist tother Dana	boliste taults on the automatic loader MKRXR	Louder Drums a sorract mechanical faults in the	loake dean components	to the next section of faults to the MKnan trader	. Mentity and connect faults in the electrical	control electeds	holder laufe in the MKana Hutst	a likerally one correct faults in the hotel	to identific and control lands to the Kawa	burst electrical control circuits	c filmittly and correct faults in the MKan				

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Course 642.ASIX1 FSPAWS Autoback

10 biolate faults in the automatic feedby MKuxu and 4.0 26PE1 a. Mentify and correct faults in the cradle between a 3.0 1.0 b. Mentify and correct faults in the cradle 3.3 3.3 3.25PE 1 b. Mentify and correct faults in the cradle 3.3 3.3 3.25PE 1 b. Mentify and correct faults in the cradle 3.3 3.3 3.25PE 1 b. Mentify and correct faults in the transfer tray 3.3 3.3 3.3 3.0 b. Mentify and correct faults in the transfer tray 3.3 3.3 3.0 c. thentify and correct faults in the remover the 3.3 3.3 3.0 b. Mentify and correct faults in the remover the 3.3 3.3 3.0 c. thentify and correct faults in the remover the 3.3 3.3 3.0 b. Mentify and correct faults in the remover the 3.3 3.3 3.0 c. thentify and correct faults in the remover the 3.3 3.3 3.0 b. Mentify and correct faults in the remover the 3.3 3.3 3.0 c. Mentify and correct faults in the remover the 3.3 3.3 3.0 c. Mentify and correct faults in the remover the 3.3 3.3 3.0 c. Mentify and correct faults in the remover the 3.3 3.3 3.3 c. Mentify and correct faults in the remover the 3.3 3.3 3.3 c. Mentify and correct faults in the remover the 3.3 3.3 3.3 c. Mentify and correct faults in the remover the 3.3 3.3 3.3 c. Mentify and correct faults in the remover the 3.3 3.3 3.3 c. Mentify and correct faults in the remover the 3.3 3.3 3.3 c. Mentify and correct faults in the faults i	2.9FE1 1-6 1-6 1-70 1-70 1-70 1-70 1-70 1-70 1-70 1-70	MK42 MOD9&10 Gunner's Mate School Troubleshoot the 6'/54 MK42 MOD10 credies MK42 MOD9&10 Gunner's Mate Schuol Troubleshoot the MK42 MOD10 (confer hay) MK42 MOD9&10 Gunner's Mate School Troubleshoot the 5'/54 MK42 MOD10 cammer MK2 MOD3.	N A N	NA NA NA NA	2	A 113 0044 A 113 0044 A 113 0044	191451 1X05 1991451 1X05 091451 1X07
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a Mensity and connect mechanical hadis in the 30 houder components be Mensity and cornect faults in the cradle hydrometric circuits c Mensity and cornect faults in the cradle secretical control decorate faults in the cradle secretical control decorate faults in the stationastic loades MKxxxx a identity and cornect mechanical faults in the sensiter tray hydraulic circuits be Mensity and cornect mechanical faults in the sensiter tray hydraulic circuits c identity and cornect laults in the transfer tray 3.33 electrons control circuits be Mensity and cornect faults in the ranner a femility and cornect faults in the ranner be Mensity and cornect laults in the ranner be Mensity and cornect laults in the ranner selectrical control circuits c Mensity and cornect faults in the ranner be Mensity and cornect laults in the ranner selectrical control circuits c Mensity and cornect laults in the ranner selectrical control circuits c Mensity and cornect laults in the sammer selectrical control circuits c Mensity and cornect laults in the sammer selectricity and cornect mechanical faults in the laborate faults and cornect laults in the sammer selectric machanical faults in the selectric and cornect laults in the selectric machanical faults in the selectric and cornect laults in the selectric mechanical faults in the selectric and cornect laults in the selectric mechanical faults in the selectric mechanical faults in the selectrons.		MK42 MOD98-10 Gunner's Mate Schinol Troubleshoot the MK42 MOD30 transfer trays MK42 MOD98-10 Gunner's Mate School Troubleshoot the 5"/Fi4 MK42 MOD30 rammer MK2 MOD3.	₫ ₫ 2	4 Z Z	<u> </u>	A 113 0044	091 46L 1X06 091 44; 1X07
be developed to components be detectively and correct faults in the cradle by deadle circuit c idensity and correct faults in the cradle decrined control decuits transfer stays transfer stays transfer stays be identity and correct mechanical faults in the transfer stays be identity and correct mechanical faults in the transfer stay be identity and correct mechanical faults in the transfer stay c identity and correct laults in the transfer stay adverticence control directs for interior control directs for interior control directs for interior and correct faults in the ransmer for interior control circuits c identity and correct faults in the ransmer for identity and correct faults in the ransmer c identity and correct faults in the ransmer debe components transfer and correct mechanical faults in the fiber components transfer and correct laults in the side hydraulic		MK42 MOD98-10 Gunner's Mate Schuol Troubleshoot the JMK42 MOD30 transfer trays MK42 MOD98-10 Gunner's Mate School Troubleshoot the 5"754 MK42 MOD30	۷ 2 2	4 Z Z	₹ ₹	A 113 0044	091 46L 1X06 091 4A: 1X07
b identify and correct faults in the cradle thereby and correct faults in the cradle determed control circuit bodyse laults in the automatic bonds MKxxx Limiter than the automatic bonds MKxxx Limiter than the automatic bonds MKxxx Limiter than correct faults in the transles tray by identify and correct faults in the transles tray by thereby and correct faults in the transles tray checkers control circuits clidentify and correct faults in the ransmer limiter and correct faults in the ransmer limiter and correct faults in the ransmer limiter fault in the automatic bonds MKxxx Lidentify and correct faults in the ransmer limiter faults in the MKxx Side the components correct laults in the sammer levited control circuits clidentify and correct laults in the sammer levited control circuits clidentify and correct laults in the sammer levited control circuits clide faults in the MKxx Side life-tited control circuits life-tited and correct laults in the sammer life components.		MK42 MOD98-10 Gunner's Mate Schuol Troubleshoot the MK42 MOD10 transfer trays MK42 MOD98-10 Gunner's Mate School Troubleshoot the 5'/F4 MK42 MOD10 rammer MK2 MOD3.	₹ ₹	¥	§ §	A 113 0044	091 45L 1X0A
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transity and correct faults in the transfer tray be kennity and correct faults in the transfer tray 3.34 hydraulic circuits c identify and correct faults in the transfer tray 3.33 electronic control directs holder faults in the automatic horder MKninx A.S. Rammer a identify and correct faults in the rammer b identify and correct faults in the rammer c identify and correct faults in the sammer electrical countrol circuits c identify and correct faults in the sammer electrical countrol circuits be identify and correct makes by identify and correct makes correct make		MK42 MOD9&10 Gunner's Mate School. Troubleshoot the 5"/Fi4 MK42 MOD10 rammer MK2 MOD3.	§ 2	₹	₹ Z	A 113 0044	091 44: 1X07
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hydraulic circuits c Identify and correct faults in the transfer tray decrease control circuits Hoter faults in the automatic londer MKnax Ranner a Identify and correct faults in the ranner b Identify and correct faults in the ranner the Identify and correct faults in the ranner c identify and correct faults in the ranner electrical control circuits c identify and correct faults in the ranner electrical correct faults in the identify and correct mechanical faults in the alternity and correct mechanical faults in the faults congenerated.		MK42 MODB&10 Gunner's Mate School. Troubleshoot the 5"/Fi4 MK42 MOD10 canner MK2 MOD3.	<u>﴿</u> 2	₹ 2	₹	A 113 0044	091 4h; 1X07
c Identify and correct faults in the transfer tray abstraction control circuits tooler faults in the automatic londer MKnax Banner a Identify and correct faults in the rammer by identify and correct faults in the rammer by identify and correct faults in the rammer c identify and correct faults in the rammer detained control circuits c identify and correct laults in the identify and correct mechanical faults in the identify and correct mechanical faults in the identify and correct faults in the idde hydraulte by frently and correct faults in the idde hydraulte		MK42 MODB&10 Gunner's Mate School. Troubleshoot the 5"/Fi4 MK42 MOD10 rammer MK2 MOD3.	₹ 2	₹ 2	₹ 2	A 113 0044	091 45; 1X07
chertrenic central directions Horlete faults in the automatic looder MKnax A.5 Ranner I fornity and correct faults in the ranner I flerity and correct faults in the ranner C. thentify and correct faults in the ranner B. fornity and correct mechanical faults in the print of the faults in the		MK42 MOD9&10 Gunner's Mate School. Troubleshoot the 5"754 MK42 MOD10 canner MK2 MOD3.	۷ 2	₹ 2	₹	A 113 0044	09144; 1X07
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th Identify and correct faults in the sammer The third and correct faults in the sammer S. Sentiff and correct faults in the sammer Solution of the solutio		MOD3.					
th Identity and correct leads in the sammer The thanks circuits Harding and correct leads in the sammer S.33 electrical control curvits Isolate faids in the MKxx Side Identity and correct mechanical faults in the same consponents Indentity and correct leads in the side hydraulte I thentity and correct leads in the side hydraulte I thentity and correct leads in the side hydraulte					_		
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electrical control carcuits Isolate faults in the MKxx Slide 8 Identify and correct mechanical faults in the slide components b fributify and correct limits in the slide hydraulte 186			_				
Include faults in the MMCxx Slide 6.93 a Identify and correct mechanical faults in the slide components b Infentify and correct leads in the slide hydraulic 186							
9		MK42 MOD9&10 Gunner's Man School	·	á	· ·		
3	E1 1:6	Troubleshoot the 5"/54 MK42 MOD10 Slide MK31	<u> </u>	É	Ě	A 113 0044	P91 451 1X08
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Land Navigation System No ASIX2

Table C4-6 Course Development Worksheet.

Commission of the company of the c					Blesses Made	1		1		
March Marc	Course Madule	Hours	Type	\$ 6	MINDON MINDON	Train Exhibit	Course			Related
1 1 1 1 1 1 1 1 1 1			Instruction	Ratio		Hours	Type Inst.	Patio	Course	Numbers
1 1 1 1 1 1 1 1 1 1	Introduction to the principles of the Land Verigotion System	1.0	10	i		2	10		101 31V1 0	113 80 X 1 X 07 1 lbru
11 15 Secretary Stand Flow and the (AST 1 20 2010 1 2 20 1 2 2 2 2 2 2 2 2 2	Introduction to the LNSX Test Set	4.5	3.8PE1	<u>.</u> 8	CR26 HE Guitte Operation of AN/VRC 12 Bade: Cas	9	3.8PE1	1:6	101-31V10	113 80X-1X01 thru
14 145 Anniach Cannel CoapCacient 5.3 1.5 1.	Test LNS Equapment Signal Flore with the LNSX Test Smi	•	2SP 6PE2 1E2	R	34G10-L-2 Student will trace FAUAC wiling	•	2SP 5PE2	8 4 5	113.34G10	113 80X 1X02
100 100	Test LNS Attitude Control Loop/Controls	85 69	4.5PE3 .8PE3	8. E.	CR2BHC Troubleshoot AN/VRC-12 Series Radio Power Imput Greuis	<u>.</u>	4.6PE1 .7PE3		101 31 / 10	113-80X-1×02
HEX rot & total 120 30010165 120 30010165 120 12	Test 1 NS Operational Modes	001	3 0SP 6.0PE2 1.0E2	5 5 5	34G10L4 FADAC Power Supplies, functional disgrams, functions, Inputs	10.0	3SP 6FE2 1E2	5. 5. 5.	113 34 G10	113 80% 1%03
Total Accepting 94.8 94.	1NSX feet Set Transfesthmating and Inspection Laboratory	9.09	4.0\$P 57.5PE1 4.5E1	12.0 13.0 13.0 13.0	34010K6 FALK fest Set Troubleshooting Laloustory	66.0	4 0SP 57.5PE1 1 6F1	5 9 9	113.34G10	113 RUX 1X04 113 BUX 1X06 113 BUX 1X06
Antiprocessing Commandant's Time Total Training Time The Training	Total Academic	84.8				_				113 ROX 1 X07
Intrinctional Breakdown SP 90 C 10 FF 869 FF 2 110 FF 3 15 FF 4 45 FF 2 20		8.0 8.0 1.2								
· · ·		112.0 2.8 weeks								
	Instructional Breakdown									
	06 35									
	•									•
1										

associated with each instructional method, (4) relevant course modules from existing courses used in developing the projected course module, (5) instructional hours for the existing modules broken down by instructional method along with their associated student instructor ratios, where applicable, and (6) the course(s) from which existing module(s) were taken¹.

Instructional hours and student instructor ratios were not listed for the Navy course modules used in developing the 642-ASIX1 course since the Navy classification scheme for instructional methods is different from that used in the Army. The Navy version of this course uses conference or C1 as the primary type of instruction. DRC has noted a tendency for the Army training to be performance based to a greater extent than comparable Navy courses. Adjustments were made for this tendency in assigning the number of hours for each type of instruction in the 642-ASIX1 course.

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APPENDIX C5 DETERMINATION OF NUMBER OF INSTRUCTORS

Estimation of the number of instructors associated with the system-specific ESPAWS courses was determined by applying a modified version of the instructor determination algorithm listed in the Staffing Guide for U.S. Army Service Schools (DA PAM 570-558). Basically, this algorithm was modified to make total instructor contacts hours a direct function of the number of students taking the course (which is determined by the number of students taking the course and the optimum class size).

C5.1 Instructor Determination Algorithm

The final modified algorithm used to determine ESPAWS instructor requirements was as follows.

NINS =
$$\left(\frac{ICH}{OC} \times NREP\right) \div 1250$$

where NINS is the number of instructors required for the course; ICH is the total instructor contact hours associated with the course, OC is the optimum class size for the course, NREP is the number of personnel taking the course and 1250 is the annual amount of instructor contact specified for an instructor in DA PAM 570~558.

Tables C5-1, C5-2, and C5-3 display the input values and calculations associated with the determination of instructors for each of the system-specific courses in the

Table C5-1. Predacessor Instructor Determination Worksheet

Number of	Instructors	(E) — 1250	506.5	1	1	4.7	2.8	17.3	9	- 		-	i	6:	1.8	ı	•
(E)			633145.5	1	ı	5892.9	3463.9	21578.4	7444.2	ı	1	-	<u> </u>	1078.8	2287.09	ı	
(C)	_		9243	N/A	N/A	39	47	333	114	ح ک	Y.	A	AN A	62	73	V.	
(C)		_	68.5	24	6.1.9	151.1	73.7	64.8	65.3	14.6	9.6	14.3	49.6	17.4	31.33	6.89	
(B) Optimum	Class Size		40*	20*	38	14	18	81	14	20*	*02	20**	. 02	20*	04	40*	
(A) Total ICH	per Class		2741.5	479.2*	2166.7	2116.4	1326.0	1166.8	914.3	291.5	172.45	286.39	991.9	347.9*	1253.2	2756	
		Course	Field Artillery Crewman	Field Artillery Turret Mechanic	Tactical Communications Systems Operator	Fire Control Instrument Repair	Metalworker	Tank Turret Repair	Artillery Repair	ESPAWS Autoloader	ESPAWS Computer	ESPAWS Land Navigation System	Power Generation and Vehicle Mech.	Track Vehicle Mechanic	Field Artillery Weapons Mechanic Course	Field Artillery Crewmen (MOD)	
	Course	Number	041-13810	643-45D10 (MOD)	101-31V10	670-41C10	700-44810	643-45K10	642-45L10	642.ASIX1	101ASIX1	101ASIX2	610-63810	611-63010	041-ASIU6	041-13B10 (MOD)	
		MOS	138	(45D)	31V	410	448	45K	45L	45L	310	310	638	930	130	138	C-82

Table C5-2. Reference Instructor Determination Worksheet

138	MOS	Course	Course	(A) Fotal ICH per Class	(B) Optimum Cless Size	(C) (CH Per Student (A B)	(D) Number of Students	(E) Total ICH (C) x (D)	Number of Instructors (E) - 1250
V 101-31V10 Tactical Communications 2166.7 35	138 (45D)	041-13B10 643-45D10 (MOD)	Field Artillery Crewman Field Artillery Turret Mechanic	2741.5	40*	68.5	NA 832	19934.72	15.9
10	31.	101-31V10	Tactical Communications Systems Operator	2166.7	£ £	61.9	AZ A	ļ	,
1326.0 18 100-44810 Metalworker 1326.0 18 19 19 19 19 19 19 19	41C	670-41C10	Fire Control Instrument Repair	2116.4	14	151.1	33	5892.9	4.7
1166.8 18 18 19 19 19 19 19 1	448	700-44810	Metalworker	1326.0	18	73.7	47	3463.9	2.8
11 642-45L10 Artillery Repair 914.3 14	45K	643-45K10	Tank Turret Repair	1166.8	18	64.8	450	29160	23.3
G42-A5 X1 ESPAWS Autoloader 291.5 20°	45L	642-451.10	Artiflery Repair	914.3	14	65.3	228	14888.4	911
101ASIX1	45L	642-ASIX1	ESPAWS Autoloader	291.5	20*	14.6	99	963.6	8 ;
101ASIX2 ESPAWS Land Navigation 286.39 20** System	310	101ASIX1	ESPAWS Computer	172.45	20.	8.6	798	6862.8	5.5
## 610-63810 Power Generation and Vehicle 991.9 20°	317	101ASIX2	ESPAWS Land Navigation System	286.39	20**	14.3	798	11411.4	9.1
IC 611-63C10 Track Vehicle Mechanic 347.9* 20° 38 041-ASIU6 Field Artillery Weapons 1253.2 40 38 041-13810 (MOD) Field Artillery Crewmen (MOD) 2756 40°	638	610-63810	Power Generation and Vehicle Mech.	991.9	20*	49.6	NA	l ————————————————————————————————————	j
38 041-ASIU6 Field Artillery Weapons 1253.2 40 Mechanic Course 38 041-13810 (MOD) Field Artillery Crewmen (MOD) 2756 40*	63C	611-63C10	Track Vehicle Mechanic	347.9*	20*	17.4	62	1078.8	6:
38 041-13810 (MOD) Field Artillery Crewmen (MOD 2756 40*	138	041-ASIU6	Field Artillery Weapons Mechanic Course	1253.2	40	31.3	NA V	ſ	1
C-83	138	041-13B10 (MOD)		2756	*04	68.9	5112	352216	281.8
	C-83			•					

Table C5-3. Concaptual Instructor Determination Worksheet

Number of instructors (E) = 1250	- 3.1 7.5 4.7 23.3 14.2 - .9 5.5 - 316.4
(E) Total ICH (C) x (D)	3840 9408.8 5892.9 3463.9 29160 176963 540.2 6862.8 8265.4 - 395554.9
(D) Number of Students	NA 160 152 39 47 450 271 37 37 37 862 NA 62 NA 5741
(C) ICH Per Student (A – B)	68.5 24. 61.9 151.1 73.7 64.8 65.3 14.6 17.4 31.3
(B) Optimum Class Size	40° 20° 35 14 18 14 20° 20° 40°
(A) Total ICH per Class	2741.5* 479.2* 2166.7 2116.4 1326.0 1166.8 914.3 291.5* 172.45* 286.39* 347.9* 1253.2 2756*
Course	Field Artillery Crewman Field Artillery Turret Mechanic Tactical Communications Systems Operator Fire Control Instrument Repair Metalworker Tank Turret Repair Artillery Repair ESPAWS Land Navigation System Power Generation and Vehicle Mech Track Vehicle Mechanic Field Artillery Weapons Mechanic Course Field Artillery Crewmen (MOD)
Course	041-13810 643-45D10 (MOD) 101-31V10 670-41C10 700 44810 642-45L10 642-45L10 642-45L10 641-63C10 041-63C10 041-ASIU6 041-13810 (MOD)
MOS	138 (450) 31V 45C 45C 45C 45C 45C 45C 45C 45C 45C 45C

ESPAWS predecessor reference, and conceptual systems respectively. The number of replacement personnel on these sheets was obtained directly from the analyses conducted in Section 8.3.3. For existing courses with readily available data, instructor contact hours per class (ICH) and optimum class size were obtained from the instructor contact hour summary on the TRADOC Form 377-R associated with the course.

Forms for some of the existing courses were not received in time to be utilized in this study. For existing course with missing data and for newly developed or modified courses, the optimum class size was assumed to be twenty except for the 13B AIT/OSUT course where a class size of forty was The value of twenty for the optimum class size was selected for most courses because it appeared to be about the average optimum class size (based on the rather small sample which DRC had available). A larger value of forty was selected for the 13B AIT/OSUT course because it was an OSUT course and these courses tended to have higher optimum class sizes. Actually, the selection of optimum class size is arbitrary since it is cancelled out by the optimum class size factor in the instructor contact hour determination algorithm described below. It is included to provide results that more closely resemble the step-by-step results listed in DA PAM 520-558.

Instructor contact hours for the modified or newly developed courses or existing courses with missing data were determined utilizing the algorithm determined in the next section.

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C5.2 Instructor Contact Hours Determination

The algorithm used to determine contact hours for a given course was as follows

$$\begin{array}{cccc}
T & H_i & X & \frac{OC}{SI_i}
\end{array}$$

where T is the number of different types of instructional methods used in the course; H_{i} is the number of hours associated with the ith method, OC is the optimum class size and SI is the student instructor ratio for the ith instructional type.

Using the formula described above, instructor contact hours for both the modified or newly developed ESPAWS courses and the existing courses which lacked available data were determined. Table C5-4 summarizes the calculations associated with the application of this algorithm. The student instructor ratio for the instructional types were taken directly form the recommended values listed in DA PAM 570-558. The hours associated with each instructor type were either taken directly from the POI (for existing courses) or the course development/modification worksheets (for modified or newly developed courses).

Table C5-4. Determination of Instructor Contact Hours

Course	Inst. Type	S/I Ratio	Optimum Class Size	Hours	ICH per Type
		20	20	23.8	23.8
643-45D10	C	20	20	1.0	1.0
	D F	20	20	.9	.9
	TV	20	20	2.6	2.6
	PE1	6	20	99 .5	326.7
	PE2	6	20	1.0	3.3
	PE3	20	20	12.2	12.2
	E1	6	20	33.0	108.9
	C 1	•			479.4
	С	20	20	.5	.5
611-63C10	F	20	20	.5	.5
	TV	20	20	.5	.5
	PE1	6	20	11.5	37.9
	SP	20	20	251.7	251.7
	E1	20	20	57.3	57.3
		•••			347.9
	С	20	20	17.5	17.5
611-63B10	ם	20	20	1.0	1.0
	PE1	6	20	189.3	625.7
	PE2	6	20	3.5	11.5
	PE3	20	20	4.0	40.0
	FE3	6	20	51.3	171.0
	E2	6	20	2.5	8.3
	E3	20	20	.7	.7
	F	20	20	.5	.5
	SP	20	20	115.7	115.7
	Sr.				991.9
-4- 40040	C/E3	20	40	50.75	101.5
041-13B10	PE1	6	40	398.25	2655.0
	1.61	_			2756
	D) C/E3	20	40	50.25	100.5
041-13B10 (MO	PE1	6	40	396.25	2641.0
	751	•			2741.5
404 4 01 114	PE1	6	20	41.9	1 <i>3</i> 8.2
101 ASI X1	TV	20	20	2.4	2.4
	D	20	20	3.2	3.2
	C	20	20	3.6	3.6
	F	20	20	.3	.3
	E1	6	20	7.5	24.75
					172.45

Table C5-4 (continued)

Course	Inst. Type	S/I Ratio	Optimum Class Size	Hours	ICH per Type
101 ASI X2	SP	20	20	9	9.0
	С	20	20	1.0	1.0
	PE1	6	20	65.8	217.14
	PE2	6	20	11.0	36.3
	PE3	20	20	1.5	1.5
	E1	6	20	4.5	14.85
	E2	6	20	2.0	6.6
					286.39
642-A\$IX1	С	20	20	20.8	20.8
	D	20	20	3.8	3.8
	PE1	6	20	66.8	220.44
	E1	6	20	14.1	46.5
					291.54

APPENDIX C6 COURSE COSTING WORKSHEETS

This appendix describes the procedures and input data which were utilized to determine training course costs for the ESPAWS predecessor, reference, and conceptual systems. The first section describes the specific calculations used in developing estimates of the cost per student for each individual course. The second section describes the specific calculations that were used to determine three additional measures of training course cost (average individual training cost, replacement personnel training cost, and cumulative personnel training cost).

C6.1 Determination of Individual Course Costs

Estimates of the cost per student for existing courses were determined directly from MOS Training Cost Handbook. Estimates of the cost per student for modified or newly courses were determined by identifying comparable existing course, obtaining relevant cost data on the existing course from the MOS Training Cost Handbook, and modifying this cost data to reflect differences between the course lengths of the existing and projected course. C6-1 displays the algorithm that was used in modifying the cost data of the comparable course. Basically, algorithm reduces (increases) the variable Military Personnel, Army (MPA) appropriation portion of the existing course costs in direct proportion to percentage decrease (increase) in course length associated with the projected

Table C6-1. Algorithm Used in Determining Course Cost per Student for Modified Courses.

CL(NEW) x VMPA(EXIST) - VMPA(EXIST) + CPS(EXIST) = CPS(NEW)
CL (EXIST)

CL(EXIST) = Course length for modified or newly developed course
CL(EXIST) = Course length for existing course
VMPA(EXIST) = Variable military pay and allowances for existing course
OCPS(EXIST) = Overall cost per student for the individual course
CPS(NEW) = Overall cost per student for the modified or newly developed course

course. It then adds (subtracts) the obtained difference between the existing and projected variable MPA costs to the overall cost of the existing course¹.

Table C6-2 lists the specific calculations used in determining course cost per student for each of the modified or newly developed ESPAWS courses.

C6.2 Training Course Cost Measures

Four different training course cost measures were calculated: <u>Individual Student Cost Per Course</u> - the cost to train an individual in an particular course (the procedures for determining this measure were described in C6.1).

Average Individual Training Cost - the average individual provides an estimate of what it would cost to train one individual who completed all of the courses contained in the training path for a particular MOS. It is determined by the following equation:

where n is the number of courses in the training path; CPS is the cost per student for the ith course, and W_i is the percentage of personnel in the MOS taking that course within

More sophisticated procedures for modifying existing course costs are currently being developed.

Table C6-2. Course Cost Modification Sheet.

Existing course used in estimation: 041-ASIU6 - Field Artillery Weapons Mechanic	x MPA(EXIST) 1110 - VMPA 1110 + Course Cost (EXIST) 2274 = New Course Cost 1918.8	(MOD) Existing course used in estimation: 041-13810	x MPA(EXIST) 1537 - VMPA 1537 + Course Cost (EXIST) 4344 = New Course Cost 4356	Existing course used in estimation: 101-ASIF7 - FADAC Mechanic	x MPA(EXIST) 920 - VMPA 920 + Course Cost (Exist) 2351 = New Course Cost 2351	Existing course used in estimation: 101-ASIF7 - FADAC Mechanics	x MPA(EXIST) 920 - VMPA 920 + Course Cost (EXIST) 2361 = New Course Cost 20.52	Existing sourse used in estimation: 642-45L10 — Artillery Repair x VMPa (exist) 3379 — VMPA 3324 + Course Cost (Exist) 9865 = New Course Cost 8200.5
Course: 642-ASIX1	CL(NEW) 3.4 CL(EXIST) 5.0	Course: 041-13B10	CL(EXIST) 12.5 CL(EXIST) 12.4	Course: 101ASIX2	2.8	Course: 101-ASIX1	CL(EXIST) 2.8	Course: 643-45D10 CL(NEW) 5.2 CL(EXIST) 10.4

the skill level in which the course is located. W_i will generally be one except for special system specific courses (e.g., ESPAWS computer course) which are only taken by a portion of the individuals in an MOS.

Replacement Personnel Training Cost - replacement personnel training cost for an MOS determined by the following equation:

Replacement Cost =
$$\sum_{i=1}^{n} (CPS_i \times NREP_i)$$

Where $\mbox{CPS}_{\hat{\mathbf{i}}}$ is the cost per student for the ith course and NREP is the number of replacement personnel taking that course.

Cumulative Personnel Training Costs - the cumulative personnel training cost for each course (CPER;) provides an estimate of what it has cost to train all the individuals at a particular point in the career path from basic training up to, and including, that course. It is determined by the following equation:

$$CPER_{i} = \begin{pmatrix} i \\ \sum \\ j=1 \end{pmatrix} CPS_{j} \times W_{j} \times NREP_{i}$$

where $CPER_i$ is the cumulative training cost for the ith course in the career path; CPS_j is the cost per student for jth course in the career path; W_j is the percentage of personnel in the MOS taking the jth course within the skill

level in which the ith course is located; and $NREP_i$ is the number of replacement personnel taking the ith course.

Table C6-3 displays the worksheets used to develop the four cost measures described above for the ESPAWS predecessor, reference, and conceptual systems. For each course in the training path, the following is listed: (a) the cost per student (CPS) - weighted costs are listed in parentheses, (b) the number of replacement personnel taking the course (NREP), (c) the replacement personnel costs for that path (axb), (d) the cumulative course costs (the sum of the course costs for that and all previous paths), and (e) the cumulative personnel training cost per course (bxd).

The Average Individual Training Cost is the sum of the weighted CPS costs in column A. The Replacement Personnel Training Cost is the sum of the costs in column C.

Table C6-3. Truining Cost Workshutt.

		(bt) Computation Prevented Tradesing Cost (E) x (G)	5 9 2 3 % 9 9 4	
		(G) Cumulative Course Cost	2999 2260 7604 8328 (10602) 14665 14665 19669 27623	
Coupapitual		(F) Replacement Personnel Training Cost (O) x (E)	27,719,767 2,412,423 40,161,592 6,691,932 166,002 11314) 8,929,244 2,632,960 260,712	86,954,622
Reference	SE COST	(E) No. of Replacement Persumel	9243 9243 9243 73 73 1116 640 28	The state of the s
# - X	THAIMING COUNSE COST	(D) Course Cont	2999 281 124 124 (2274) 18 8209 4114 8964	27,623
MIS 138		(C)	Basic Transum Recupton Field Artillery Crousman Leaws/Administs aton Field Artillery Weapons Muchanic Firmary NCO Advanced NCO	
		Course Name	8CT Rec. 041-13-1110 1.V-AD1 041 13630 041 13630 041 13630	
20 SC		(A) Payagaala/ Shill Level	89 -	IOIAL

Table C6-3. Training Cost Worksheet. (continued)

	(E) x (G)	16,330,888 18,865,120 38,932,892 6,038,160 16,222,135 11,944,320	
ļ	(G) Cumulative Course Cost	2889 3280 7616 8340 14649 18663 27617	
Cnicoptual	(F) Replacement Personnal Trainfing Cost (D) x (E)	15,330,888 1,334,232 22,267,872 3,701,088 6,923,036 2,632,940 0	62,190,075
Reference X	(F) No. of Replacement Personnet	6112 5112 6112 1716 840 0	
Reference TRAINING COURSE COST	(D) Course Cost	2888 281 4358° 724 6308 4114 8864	27,617
Preducessor	(C)	Bedic Training Receptes Field Artiflery Creeman Leave/Administration Primary NCO Basic NCO Advanced NCO	
•	(B) Course Number	BCT Nec. (MOD) (V-AD) 041-13830 BNCOC138 0-13-C42-ADV	
MOS 138	(A) Prygrade/ Shift Level		fotal

Table C6-3, Training Cost Worksheet. (continued)

		(94) Cumulative Personnel Training Cost (E) n. (G)	172,117,258 18,716,660 43,723,466 47,879,940 16,222,136 11,944,320 0	
;		(G) Course Cost	2999 3290 7816 8340 14549 19663 27617	
Conceptual		(F) Neplacement Personnel Training Cost (D) x (E)	172,117,256 1,488,401 26,007,796 4,156,484 8,923,036 2,632,960 0	1
Reference	SE COST	(E) No. of Replacement Personnel	6741 6741 1116 940	
Reference	TRAINING COURSE COST	(D) Course Cost	2896 2 261 4 356° 4 114 4 114 9 9 6 4	27,617
Predecessor		(C)	Basic Training Recaptive Field Autiliary Covernan Leave/Administration Primary NCO Basic NCO Advanced NCO	
		2	BCT Rec. 041-13 B10* (WDD) LV-AD1 041-13830 BMCDC138 0-13-C42-ADV	
MOS 138		Sample S		TOTAL

Table C63. Training Cost Workshoot. (continued)

MOS 31V		Predecessor.	X (none)	Reference	Conceptual	ļ		
			THAINING COURSE COST	JASE COST				
3	Œ	(3)	(0)	(E)	(F)	(C)	(11)	
Faygade/	Course	Course	Course	No. of Replacement Personnel	Training Cost	Course Cost	Trabaling Cost	
					W 7 15)		721 6 721	T
-	BCT	Besic Training	2999	•	•	2999	•	
-	REC	Reception	261	•	•	3260	•	
•	160-31V10 (160-101-31V 10)	Tactical Communication Systems Operator	2898	•	•	6158	•	
•	LV/ADI	Leeve/Administration	124	•	•	6882	•	
~	214	Primary Leadership Training	2893	•	•	9776	•	
e	(10034030)	Tactical Electronic Equipment Basic NCO	4872	•	•	14647	•	
•	IEE C428	Tectical Electronic Equipment Advanced NCO	9963		•	21600	6	
		e e e e e e e e e e e e e e e e e e e				A STATE OF THE PERSON NAMED OF THE PERSON NAME		. 1
TOTAL			21,600		۰			

Table C6-3. Training Cost Worksheet. (continued)

MOS 31V	1	Predecessor	į	Neference X	Conceptual	<u> </u>		
			TRAINING COURSE COST	•				
3	89	(0)	(0)	(3)	(F) Renderenter Personnel	(G) Cempfelbe	(1-1) Cumufative Percented	
Paygrade/ Skill Level	Course	Cours	Course Cost	No. of Replecement Presonnel	Training Cost (D) x (E)	Course Cost	Trainfug Cost (E) x (G)	
-	BCT	Basic Training	2889	798	2,393,202	2999	2,393,202	_
	REC	Receptee	261	798	208,278	3260	850,860	_
	160-31 V10	Tactical Communication System Operator	2898	798	2,312,604	6158	4,914,084	
	LV/ADI	Leave/Administration	724	198	677,762	6882	5,491,836	
	101ASIX1*	ESPAWS Computer	2351	798	1,876,098	9233	7,367,934	
	Plc	Primery Leadership Training	2893	578	1,672,154	12126	7,008,828	_
	101ASIX2*	ESPAWS Land Navigation System	2052	578	1,186,056	14178	8,194,884	
-	10/31/30	Tactical Electronic Equipment Basic NCO	4872	G	c	19050	c	
		Tactical Electronic Equipment Advanced NCO	6966				•	
TOTAL			28.003		10 226 144			
					10,620,117			

Table C8-3. Training Cost Worksheet. (continued)

NE 31V	2	Predecessor	; ;	Reference	Conceptual	!	
			TRAINING COURSE COST	UNSE COST			
(A) Paygrade ((B) Course Number	(C)	(D) Course Corr	(E) No. of Replecement Personnel	(F) Replacement Personnel Traksing Cost	(G) Cumulativa Creare Cost	(11) Cantadative Personnel Training Cost (E) m (G)
						•	
	BCT	Besic Training	28.182	162	39,672	3260	495,520
	180-31V10 (180-101-31V 10)		2008	152	440,496	6158	936,016
-	LV/ADI	Leave/Administration	724	162	110,048	6882	1,046,064
-	101AS/X1*	ESPAWS Computer	2361*	152	357,352	9233	1,403,416
~	PLC	Primary Leadership Training	2893	•	•	12126	•
2	101ASIX2*	ESPAWS land Navigation System	2062	° .	•	14178	•
m	10/31/30	Tactical Electronic Equipment Basic NCO	4872	•	•	19050	•
•	IEE-C428	Tactical Electronic Equipment Advanced NCO	6853	•	0	28003	•
							•
				The second section of the second section secti	!		
TOTAL			26,003		1,403,416		

									[[
		(14) Cumulative Personnel Training Cost (E) x (G)	116,961	127,140	1,282,126	1,310,361	•	6	•	
į		(G) Countaive Course Cost	5692	3260	32876	33598	36492	47164	26 182	
Conceptual		(f) Replacement Personnal Training Cost (D) x (E)	116,981	10,179	1,154,995	33,599	0	•	•	310,361
Reference XX	nse cost	£ 2	8	8	R	£	•	•	•	
×	FRAINING COURSE COST	(D) Course Cost	2996	582	29616	724	2863	10672	7986	55,160
Predecessor		(C) Courte	Besic Training	Receptes	Fire Control Instrument Reposit	Leave/Administration	Primary Leadership Training	Mech. Maint. Basic NCO Course	Mech. Maint. Advanced NCD	
ı		(B) Course Nomber	128	REC	670-41C20 (670-41C10)	LV/AD! (41C20)	PLC (41C20)	6.100.00 (410.30)	(412-40)	
MOS 41C		(A) Paygrado/ Skill Lend	•	-	-	ŗ	2	•		TOTAL

Table C63. Training Cost Workshiet. (continued)

		(G) (H) Cumulative Percentel Course Cost Trainfing Cost	(E) x (G)	140,963	3260 153,220	3984 187,248	12650 689,860	15443 0		
Contraptual	,	(F) Replacement Personnel Currer Technique Cost	(G) r (E)	140,963	12,267	34,028	402,602	- 15		
Reference X	URSE COST	(E) No. of Replacement		4	•	\$	•	•	<u>,</u>	
×	TRAINING COURSE COST	(D) Course		2880	261	724	9098	2893	10672	
Prefecessor		(C)		Basic Training	Recepter	Leave/Administration	Metal Worker	Primary Leadership Training	Mach. Maint. Basic NCO Course	
ļ		C S		9 C4	REC	LV/ADI	704.44820 (44810)	PLC (44820)	6 AND C40 (44939)	
90 SOM		(A)		•	•	•	-	2	m	

Table C6-3. Training Cost Worksheet. (continued)

		(11) Cumulative Personnel Testining Cret (E) x (G)	2,465,168	2,712,320	10,137,068	964.471		912,380	
ı		(G) Cumulativa Course Cost	5062	3260	12184	18393	22507	194 194	
Courspland		(F)	2,496,168	217,152	902,368	291,623	6	259,586	10,606,577
Reference	ISE COST	(E) No. of Replacement Personnel	28	832	258	5	•	R	
	TRAINING COURSE COST	(D) Course Cost	588	761	224	6029	4114	3	31,461
Predecation		(C) Course	Book Trainding	Recopted Field Artiflery Turret*	Machanic Laave/Administration	Primary NCO	Basic NCO	MCO MCO	
1300.00		E	138	NEC.	LV.AD1	041-13636	BMCOC13B	013C42 ADV	
19081) 099 SOM		3 11 8 8			-	~	.	•	TOTAL

Table C6-3. Training Cost Worksheet. (continued)

	(1/1) Cumulative Personnel Training Cret (E) x (G)	479,840 621,880 1,833,800 1,849,440 801,257 0 812,369	
1	(Q) Currulative Course Cost	2898 3280 11.460 12.184 18383 22567 31461	
Crescaptual	(F) Replacement Personnel Training Cost (D) x (E)	479,840 41,780 1,312,000 116,840 201,823 0 269,886	2,500,929
Reference	(E) No. of Replecement Personnel	8 8 8 5 6 8	
	(D) Course Cost	288 2200° 2200 41114 41114	31,461
Predecessor	(C) Crerse	Basic Trainding Recapies Field Artiflery* Twrest Machanic Lecent/Administration Primary BECO Basic NCO Advanced NCO	
900	2 1 1	BCT NEC 643-46010* (MOD) LV-AD1 041-13630 104-13630 104-13630 104-13630 104-13630	
BinEti Opp Buse	Sales Constitution		

Table C6-3. Training Cost Worksheet. (continued)

					
	(14) Computation Personnel Trainming Cost (E) x (G)	998,887 1,085,580 5,883,664	5,904,756	•	
i	(G) Course Cost	2898 3280 17008	17/32	79. E. C.	
Conceptual	(F) Replacement Personnel Training Cost (D) x (E)	998,967 96,913 4,578,064	241,062	•	6,220,093
Reference MASE COST	(E) No. of Replacement Personnel	333 333	333	•	
X Reference	(D) Course Cost	261 261	724	10672	31,297
Prefecensor	(C)	Busic Training Receptes Tank Turret Repairer	Leswa/Administration Primary Leadership Training	Mach. Maint. Basic NCO	
	(B) Course Mumber	BCT REC 643-45K20 (643-65K10)	LV/AD1 (45K10) PLC (45K20)	6-MM-C40 (45K30)	
MNXS 46K	(A) Paypode/ Skill Level		- 8	M	TOTAL

Table C6-3. Training Cost Worksheet. (continued)

		(11) Cumulative Personnel Training Cost (E) n (G)	1,349,550	1,467,000	7,663,600	7,976,400	3,011,250	е	
		(G) Course Cost	2988	3260	17008	17732	20625	31.287	
Conceptual		(F) Roplacement Personnel Training Cost (D) x (E)	1,349,550	117,450	6,186,600	326,800	422,378	•	8,401,778
Roference	rse cost	(E) No. of Replacement Personard	980	450	450	• 024	146	•	
	THAINING COURSE COST	(D) Course Cost	8862	26 1	13748	2 27	2863	10672	31,297
Predecessor		(C)	Busic Training	Receptes	Tank Turret Repairer	Leave/Administration	Primary Leadership Training	Macch. Malent. Beate NCO	
		(D) Course Number	BCT	BEC	643-45K20 (643-45K10)	LV/AD!	PLC (46K20)	6-4M4-C-00 (465K.30)	
ASA 86M		(A) Preparate/ Shift Lovel		-	•	•	~		FOTAL

Table C6.3. Training Cost Worksheet. (continued)

		(14) Community Parameted Training Cost (E) x (G)	341,896	371,640	1,406,250	1,578,796	437,100	•		
ţ		(G) Course Cost	2688	3260	13125	• •	16742	27414	0179	
Conception		(F) Replacement Personnel Training Cost (D) x (E)	34,086	29,754	1,124,610	82,536	144,850	9	•	1,415,636
Reference	ISE COST	(E) No. of Replacement Personand	2	***	***	114	9	•		
,	THAMING COURSE COST	(D) Cuerse Cost		ž	988	ž	2003	10672		36,410
Predection		(C)	Date Training	Receptes	Arithery Repair	Lonus/Administration	Primary Leadership Training	Mach. Maint. Basic NCO Course	000	
1		Charac	DCT	MEC	642 46110	10//400	P1.C (461.20)	PART SEL	190.00	
199 808		3 100		•	-	•	2	6		

Table CB3. Training Cost Workshort. (continued)

		someral										
		Correspondentive Personnel	(E) x (G)	683,772	743,280	2,982,500	3,167,572	1,040,622	964,900	•	•	
			Į.									
ļ		Currenteetive	Course Cost	88	3260	13126	13849	(15767)	17200	27870	9	
Couragelus		(F) Replacement Personnel	Fredrich Cost (D) x (E)	683,772	59,506	2,249,220	166,072	126,550	144,950	•	•	3,428,810
×	1							•				
Reference	RSE COST	(E) No. of Needlechmant	Personnel	82.2	228	8 22	822	£ 3 <u>3</u>	8	•	•	
	TRAMING COURSE COST	2	Cost	3888	Ŕ	*	124	(1918)	2003	10672	•	386.98
Pedecesser	6	٥		Boole Trainsing	Receptus	Artillery Repair	Laure/Administration	ESPAWS Autoloader	Primary Londership Training	Mech. Maint. Besic NCO Course	Monto Maleri Advanced NCO Course	
		ı	1	907	MEC	642-461.20	10/40	#ZASIX1	FLC 466.20	6-1884 C40 (451.30)	663.02 HS1.69	
198		3	See Level	1	•		•	-	~	•	•	TOTAL

Table C63. Training Cost Worksheet. (continued)

		(G) (H) Cumulative Perunnel Training Cost (E) x (G)	996 812,729	3240 850,980	13125 3,666,976	3,763,079	(16767) 663,379 14117 (622,329)	17010 860,500	27862 0	35678 0	 	 	,		
×		(G) Currelative Course Cost	, x	∺ —	13	E.		¥ 	<u> </u>	<u> </u>		 _		-	<u> </u>
Conceptual	•	(F) Replacement Personnel Training Cost (D) x (E)	612,729	16,731	2,673,416	196,204	70,966	144,650	•	•	 		. 		3.964,685
Reference	INSE COST	(E) No. of Replacement Personned	271	233	1/2	142	37 (37)	28	•	•		 			
	TRAINING COURSE COST	(D) Course Cost	2808	Ŕ	9000	724	2 8	58 0	10672	9867					35,678
Producestor		(C)	Basic Training	Recaptee	Artiflery Repairs	Leave/Adrahatration	ESPAWS Autoloader	Primary Leadership Training	Mach. Maint. Basic NCO Course	Mach. Maint. Advanced					· · · · · · · · · · · · · · · · · · ·
1		(B) Course Number	BCT	REC	642-451.10	LV/AD!	642ASIX1	PLC (451.20)	6-1451-30) (451-30)	455.409		 			
199 84.8	·	S S S S S S S S S S S S S S S S S S S		-	-	•	-	~	м	•					TOTAL

(B)	SQM	5	Prachaessor	×	Reforence	Conceptual X	1		
Course C				TRAINING COL	IRSE COST				1
Court Cour	3	3	(3)	•	9	(£)	(Q)	(1.1)	
### DECT Basic Training 2889 0 0 2899	Table .	Course	Course	Course	No. of Replacement Percental	Training Cost	Course Cost	Training Cost	
### Comparison of the Company of the						(D) x (E)		n × a	į,
Marco Marc					,		,	•	
NEC Piccipies 281 0 1220	~	5	Basic Trainling	2	•	•		.	
LV/ADZ Learn/Administration and 2867 0 0 7761 (42810)	-	REC	Receptee	5	•	•	3260	•	
Common C	-	616-63820	Power Generation and Vehicle Mach.	7900	•	•	7127	•	
FILC Primary Leadership Training 2883	-	10//AD/ 6(36)	Leave/Administration	*	•		7861	•	
(\$3830) Course Course (\$3830) Annual Basic NCO 77971 279 279.250 (\$611) (\$3830) Annual Basic NCO 77996 0 0 276511 (\$3840) Annual Basic Printery NCO 77996 0 0 276511 (\$3840) Annual Basic Printery NCO 77996 0 0 276511	~	PLC (62820)		2003	5	5	10744	6	
(639-60) Mach Mahri Primary NCO 7996 0 0 28611	m	646.45J40E (63830)	Mech. Maint. Basic NCO Course	7871	8	228,259	: 96 16	639,836	
	•	6-63 C42 (638-60)	Mach. Malnt. Primary NCO	7996	•	6	11992	•	
11992									
110/02									
78,611									
78,011					-				
7.0.011									
28,011									
190'82									i
	TOTAL			26,611	1	-			!

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303		Predecessor	•	Reference X	(interesting		
			FILAIRUNG COUNSE CUST	MSF COSI			
-	9			(4)	(F) Centrent Personal	(G) Cumulativa	(11) Cuttedative Personate
	Course	Cinto	Cost	No of Replacement	Training Cost (D) x (E)	Course Cost	Training Cott (E) x (G)
	BCT	Restic Training	2989	62	185,928	2898	145,938
	REC	Recaptive	261	82	161,182	3260	212,120
	611-63C20 (611-63C10)	Track Vehicle Mechanic	12602	62	781,324	15862	983,444
	LV/ADI (63C10)	Loave/Administration	724	62	44,488	16586	1,028,3.62
	PLC (63C20)	Primary Leadership Training	2883	P	243,012	19479	1,636,236
-	6 MM C40 (63C30)	Mech Maint Basic NCO	10672	22	288.144	30151	R14.077
	6 63 C42 (63C40)	Mech Maint Advanced NCO	7986.	8	c	36147	·
				· · · · · · · · · · · · · · · · · · ·			
	-						
							
					1		